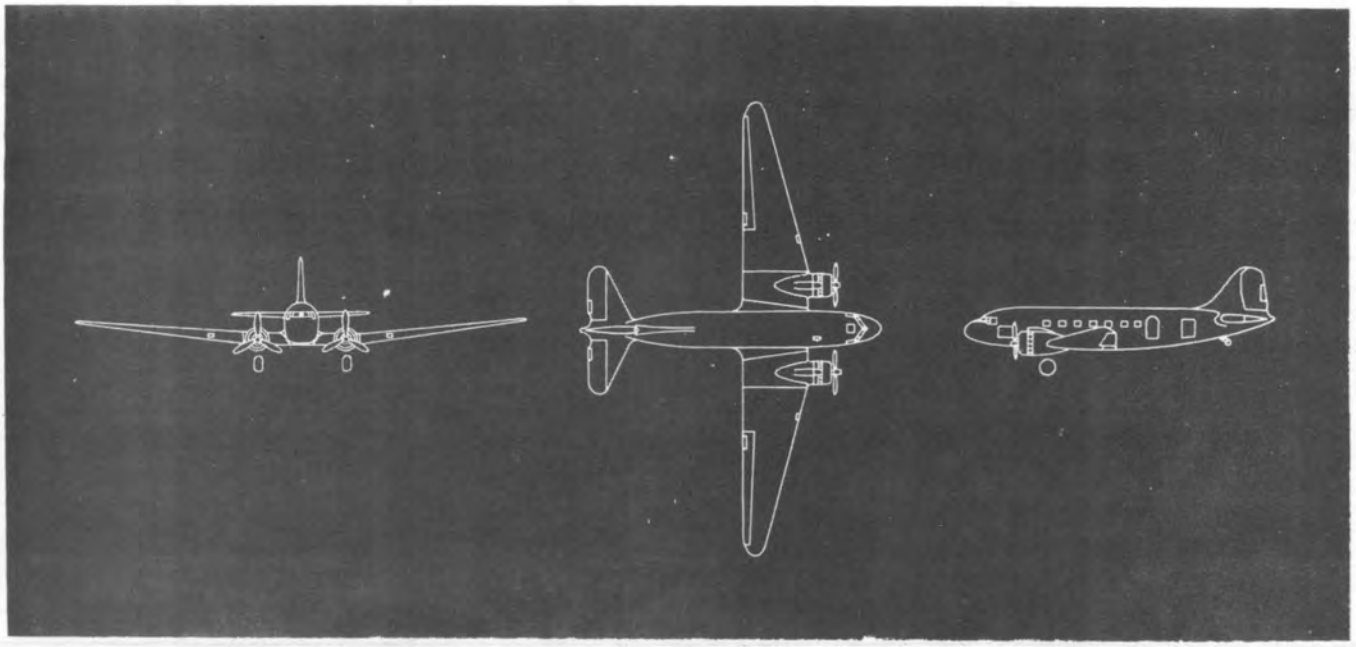
The Aircraft



THE AIRCRAFT.

The C-47, C-47A, C-47B, C-47D, HC-47, C-117A, C-117B, C-117C, R4D-1, C-47H, C-47J and TC-47K aircraft, manufactured by the Douglas Aircraft Company, Inc., are twin-engine, low-wing monoplanes, equipped with a retractable main landing gear. The C-47 series and R4D series aircraft are designed for use as cargo, ambulance or troop transports, while the C-117 series aircraft are personnel transports. The HC-47 is a C-47 series aircraft modified by Land Air, Cheyenne, Wyoming, for long range missions. Some aircraft have provisions for carrying propellers and releasable parachute packs on the underside of the fuselage.

MAIN DIFFERENCES TABLE.

The main differences table shows both the C-47 and C-117 series aircraft for cumulative comparison.

AIRCRAFT DIMENSIONS.

The principal dimensions of the aircraft are:

Span ..... 95 feet
Length ..... 64 feet 5½ inches
Height ..... 16 feet 11 inches

AIRCRAFT GROSS WEIGHT

The design landing gross weight for NORMAL operation is 26,000 pounds; however, the maximum permissible weight of the aircraft can vary within broad limits, depending on certain weight controlling criteria. For more detailed weight information, see Operational Weight Limitations, Section V.

INTERIOR ARRANGEMENT.

The C-47 series and R4D series aircraft are designed to carry various loads. Folding benches for 27 or 28

MAIN DIFFERENCES TABLE

ITEM	*C-47, C-47A*	*C-47B, C-47D*	*HC-47*	*C-117A, C-117B*	*R4D-1, C47-H*
ENGINE	R-1830-92	R-1830-90C, C-47B R-1830-90D, C-47D	R-1830-90D	R-1830-90C, C-117A R-1830-90D, C-117B	R-1830-92
ASTRODOME	YES	SOME	YES	NO	
CARGO DOORS	YES	SOME	YES	NO	
AIRLINER SEATS	NO	SOME	NO	YES	
MAIN CABIN EMERGENCY EXIT	2	2	2	3	
CARGO SPACE HEATER	NO	NO	SOME	NO	
APP	SOME	SOME	SOME	SOME	
BUFFET	NO	NO	NO	YES	
NAVIGATOR'S STATION	YES	YES	YES	NO	
FUEL TANKS	4	4	8	4	
SKIS	SOME	SOME	SOME	NO	
ALARM AND WARNING SYSTEM	YES	YES	YES	NO	
STEWARD'S SEAT	NO	NO	NO	YES	
PARA PACK PROVISIONS	YES	YES	YES	NO	
PARATROOP PROVISIONS	YES	YES	YES	NO	
JATO	YES	YES	YES	NO	

passengers are installed along both sides of the main cabin compartment. When used as an ambulance transport, 15 to 24 litters (depending on litter arrangement) can be installed. Loading provisions permit transport of a variety of cargo (figure 1-1).

On C-117 series aircraft, the main cabin is equipped with 21 adjustable reclining passenger seats and one folding seat for the flight steward. The passenger seats are arranged in seven rows of three seats each, with double seats on the left side of the aisle and single seats on the right. A buffet is installed at the rear of the main cabin on the left side just aft of the passenger entrance door and a lavatory compartment is located aft of the main cabin (figure 1-1).

FLIGHT CREW (C-47 AND R4D SERIES AIRCRAFT)

Accommodations are provided for a crew of six: pilot, co-pilot, radio operator, loadmaster, navigator, and flight mechanic (figure 1-1).

FLIGHT CREW (C-117 SERIES AIRCRAFT).

Accommodations are provided for a crew of four: pilot, co-pilot, radio operator, and steward (figure 1-1). A folding seat is also provided on some aircraft, aft of and between the pilot and co-pilot, for a flight examiner.

ENGINE.

The aircraft is powered by two 14-cylinder, twin-row, radial, air cooled Pratt and Whitney R-1830-90C, R-1830-90D, or R-1830-92 engines. The R-1830-90D or R-1830-92 engine incorporates a single speed integral supercharger, and the R-1830-90C engine incorporates a single-stage 2-speed integral supercharger. On some aircraft, with the R-1830-90C engine installed, the high blower has been made inoperative. An injection type carburetor and a direct-cranking starter, or a combination electric-inertia, direct cranking starter is installed.

THROTTLE LEVERS AND FRICTION LOCK.

Two throttle levers, mounted on the control pedestal (2, figure 1-10), are connected by a cable system to the throttle control on each carburetor. The throttles are mechanically operated and equipped with a friction-type lock to prevent creeping of the controls (6, figure 1-10). The placarded throttle positions are CLOSE and OPEN. The throttle range between these positions is used for the desired power setting.

MIXTURE CONTROL LEVERS AND THUMB LATCH LOCK.

Two mixture control levers, mounted on the upper right side of the control pedestal (3, figure 1-10) are connected by a cable system to the mixture control on each carburetor. The mixture control levers have the following positions: IDLE CUT-OFF, AUTO-LEAN, and AUTO-RICH. The IDLE CUT-OFF position cuts off all fuel flow to the engine, except for priming. The AUTO-LEAN position automatically provides the fuel air ratio required for cruise operation with normal cylinder head temperature. The AUTO-RICH position provides a richer fuel-air ratio for the higher power settings. Each mixture control lever is equipped with a thumb-latch lock which mechanically releases the lever when depressed.

CARBURETOR AIR SYSTEMS.

One of three types of carburetor air induction systems is installed in the aircraft: ram, ram-filtered, or ram-nonram filtered.

NOTE

On some aircraft the carburetor doors may be checked visually for operation

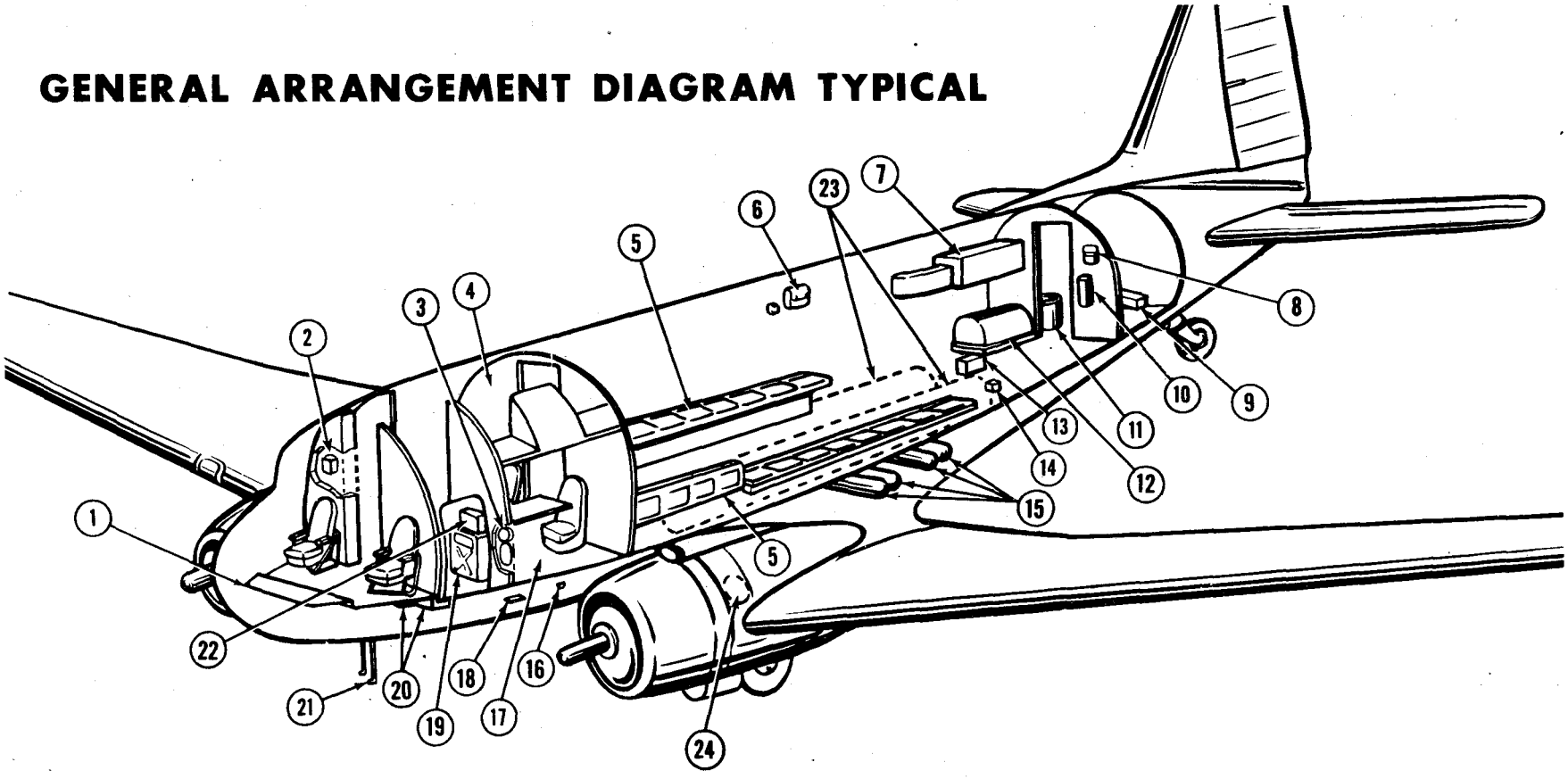
RAM-TYPE CARBURETOR AIR SYSTEM.

The ram-type carburetor air system (figure 1-3) provides two ways of supplying air to the carburetor. A small duct, located on the top forward edge of the engine accessory cowling, routes cold ram air directly to the carburetor throat, or, ram air flows inside the cowling past the exhaust collector ring and is preheated prior to entering the carburetor throat. The source of air supply is determined by the position of the carburetor air preheat door in the carburetor air intake throat.

Carburetor Air Control Levers and Friction Lock Lever.

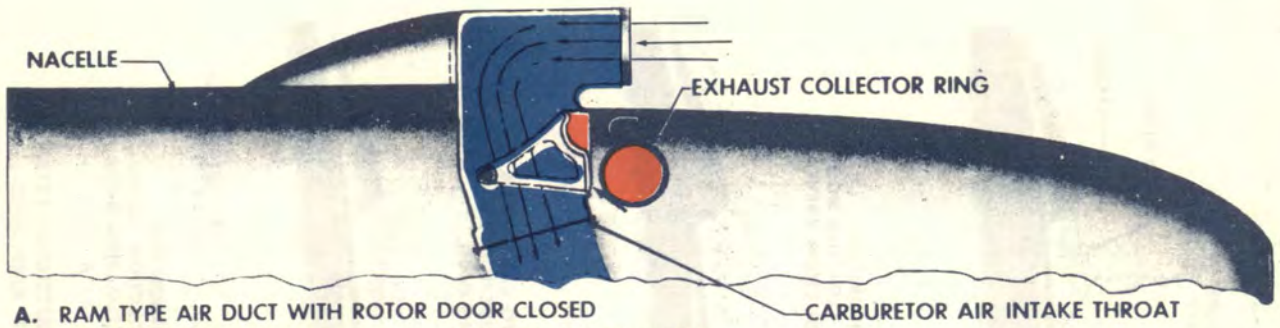
Two carburetor air control levers, one for each engine, mounted on the right side of the control pedestal (4, figure 1-10), mechanically control the movement of their respective preheat door in the carburetor air intake throat. The control levers have HOT and COLD placarded positions. In the HOT position, the carburetor air preheat door shuts off the ram air flow to allow the preheated air to flow from inside the cowling past the exhaust collector ring and into the carburetor. In the COLD position, the preheat door shuts off the preheated air flow and allows ram air to flow from the scoop to the carburetor (figure 1-3). Intermediate positions are

GENERAL ARRANGEMENT DIAGRAM TYPICAL



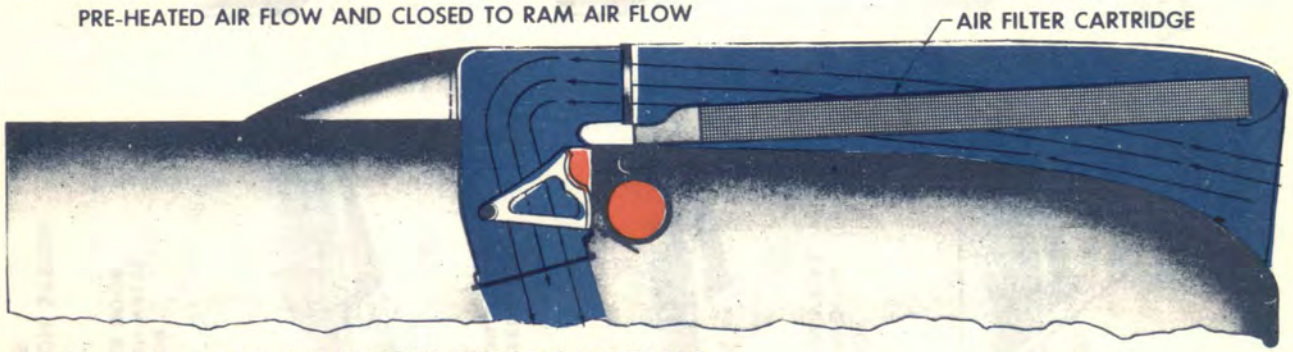
1. PILOTS COMPARTMENT
2. HYDRAULIC PRESSURE ACCUMULATOR
3. PORTABLE OXYGEN CYL.
4. RADIO OPERATORS COMP.
5. FOLDING TROOP SEATS
6. LITTER HANGER
7. SPACE HEATER
8. MISC. STOWAGE
9. ENG. COVER STOWAGE
10. SURFACE CONTROL LOCKS STOWED
11. TOILET
12. A.P.P.
13. PARAPACK CONTROL JUNCTION BOX
14. LOW PRES. SYS. OXY. FILLER VALVE
15. LOW PRES. SYS. OXY. TANKS
16. ALTERNATE STATIC SOURCE
17. NAVIGATORS COMPARTMENT
18. EXTERNAL POWER RECEPTACLE
19. MAIN ELECTRICAL JUNCTION BOX
20. BATTERIES
21. PITOT STATIC TUBE
22. POWER SYSTEMS JUNCTION BOX
23. L.R. FUEL TANKS
24. C.B. CONTAINER

Figure 1-1



A. RAM TYPE AIR DUCT WITH ROTOR DOOR CLOSED TO PRE-HEATED AIR FLOW AND OPEN TO RAM AIR FLOW

B. RAM TYPE AIR DUCT WITH ROTOR DOOR OPEN TO PRE-HEATED AIR FLOW AND CLOSED TO RAM AIR FLOW



C. FILTERED RAM TYPE AIR DUCT WITH ROTOR DOOR OPEN TO FILTERED RAM AIR FLOW AND CLOSED TO PRE-HEATED AIR FLOW

D. FILTERED RAM TYPE AIR DUCT WITH ROTOR DOOR CLOSED TO FILTERED RAM AIR FLOW AND OPEN TO PRE-HEATED AIR FLOW

RAM AIR
HOT AIR

Figure 1-3 (Sheet 1 of 3)

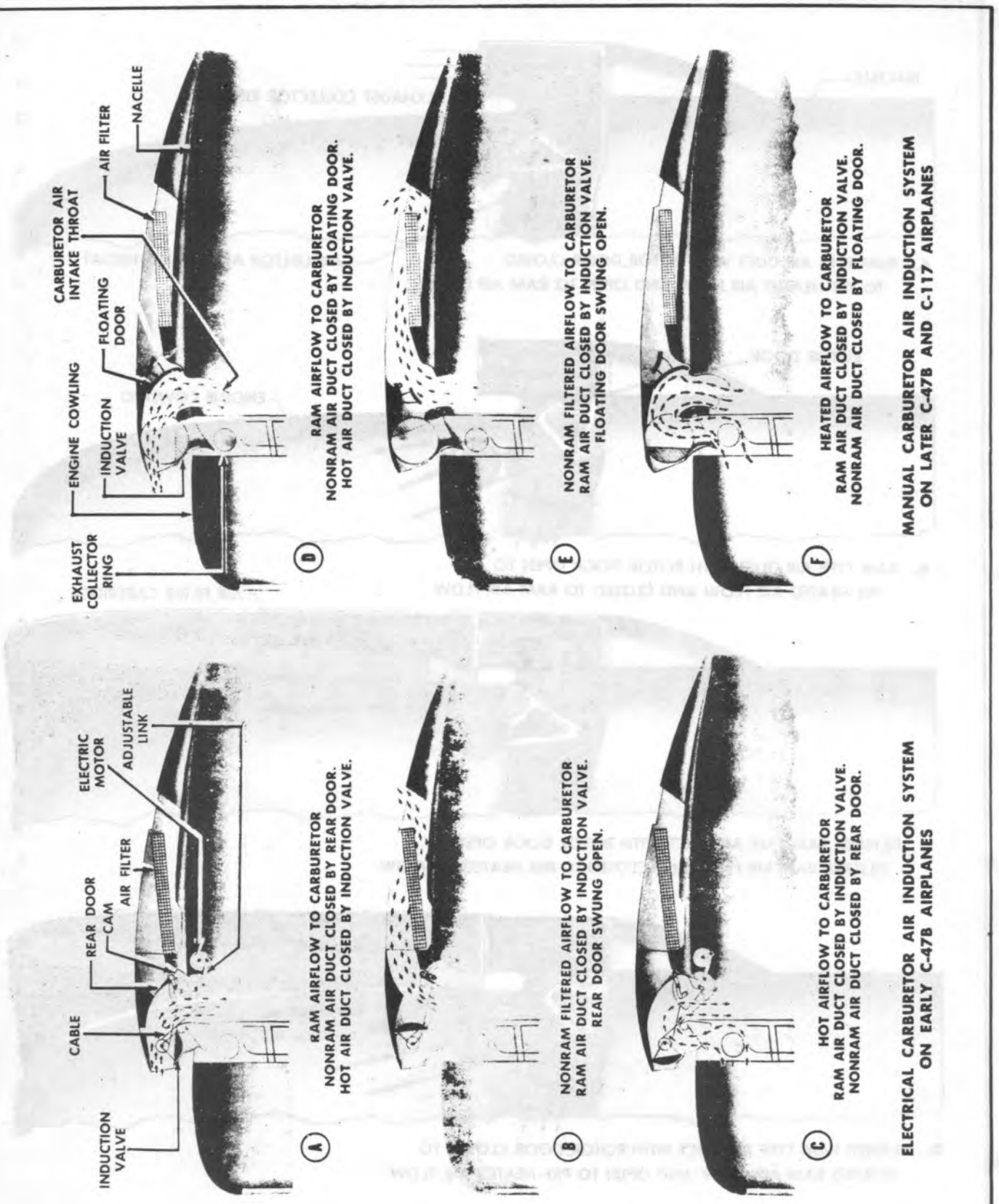


Figure 1-3. (Sheet 2 of 3)

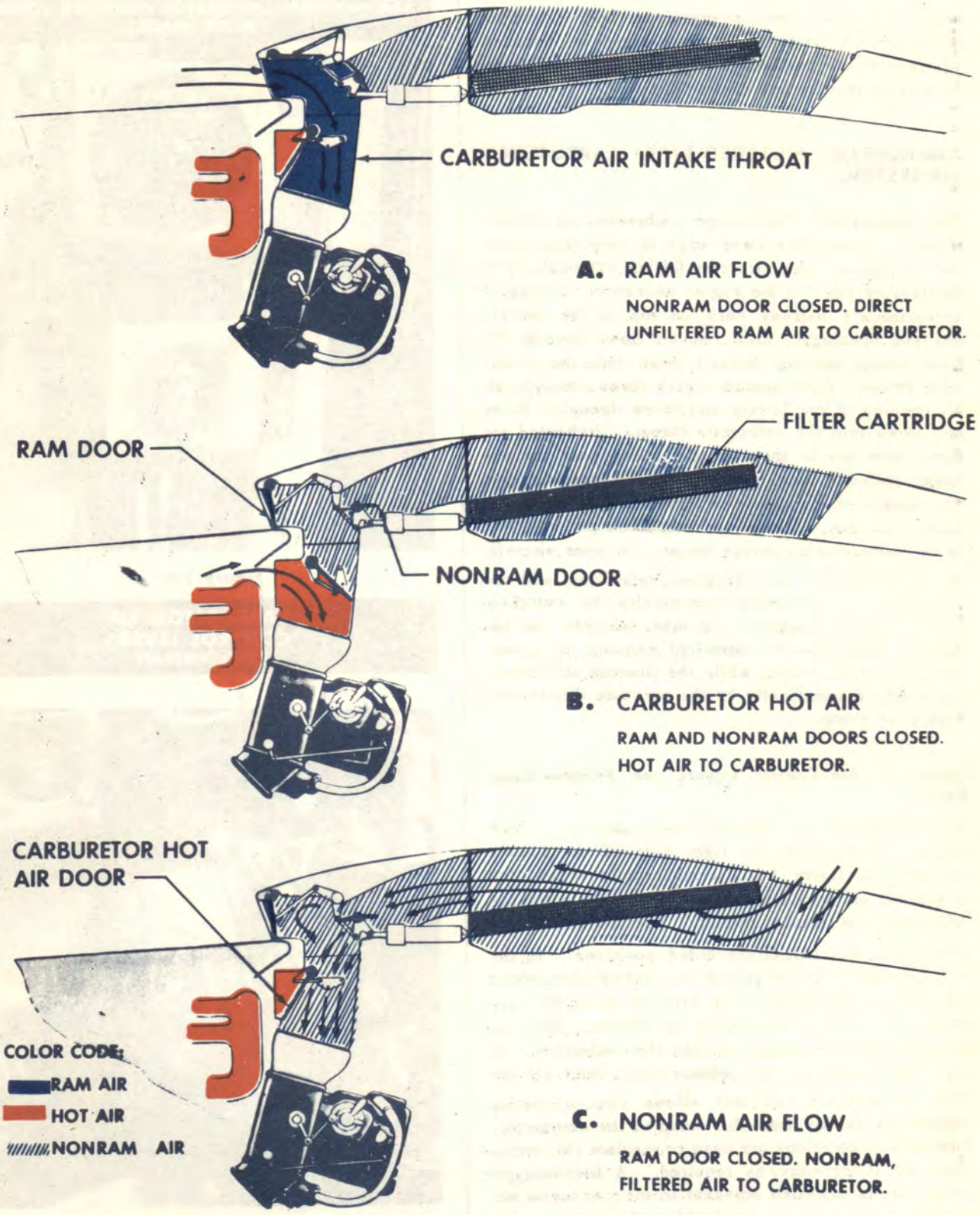


Figure 1-3. (Sheet 3 of 3)

used to regulate the carburetor air temperature as required. A friction-type lock lever is installed adjacent to the carburetor air preheat control levers for locking them in any desired position.

RAM-NONRAM FILTERED-TYPE CARBURETOR AIR SYSTEM.

The ram-nonram filtered-type carburetor air system (figure 1-3) provides three ways of supplying air to the carburetor. An airscoop fairing extending from the leading edge of the engine accessory cowling to approximately halfway back on top of the nacelle has two openings. Cold ram air flows through the front scoop opening directly down into the carburetor throat. Cold nonram air is drawn through the aft opening of the fairing and flows through a filter unit down into the carburetor throat. Preheated air flows from inside the engine cowling past the exhaust collector ring and into the carburetor throat. The source of air supply is determined by the position of the ram, nonram, and carburetor preheat door in the carburetor air intake throat. On some aircraft, the positioning of the induction valve door and the aft door, is controlled electrically by switches located in the cockpit. On other aircraft, the induction valve door is controlled manually by levers located in the cockpit, while the floating aft door is positioned automatically by the pressure differential within the scoop.

Carburetor Air Control Levers and Friction Lock Lever.

Two carburetor air control levers, one for each engine, mounted on the right side of the control pedestal (4, figure 1-10), mechanically control the movement of their respective preheat door in the carburetor air intake throat. The control levers have HOT and COLD placarded positions. In the HOT position, the carburetor air preheat door shuts off the ram and nonram air flow to allow the preheated air to flow from inside the cowling, past the exhaust collector ring, and into the carburetor. In the COLD position, the preheat door shuts off the flow of preheated air and allows ram or nonram filtered air to flow from the scoop to the carburetor. Intermediate positions are used to regulate the carburetor air temperature as required. A friction-type lock lever is installed adjacent to the carburetor air preheat control levers for locking them in any desired position. On some aircraft, the control levers have three placarded positions, HOT, RAM, and FILTERED (figure 1-5).

RAM-NONRAM CARBURETOR AIR FILTER CONTROL VALVE HANDLE

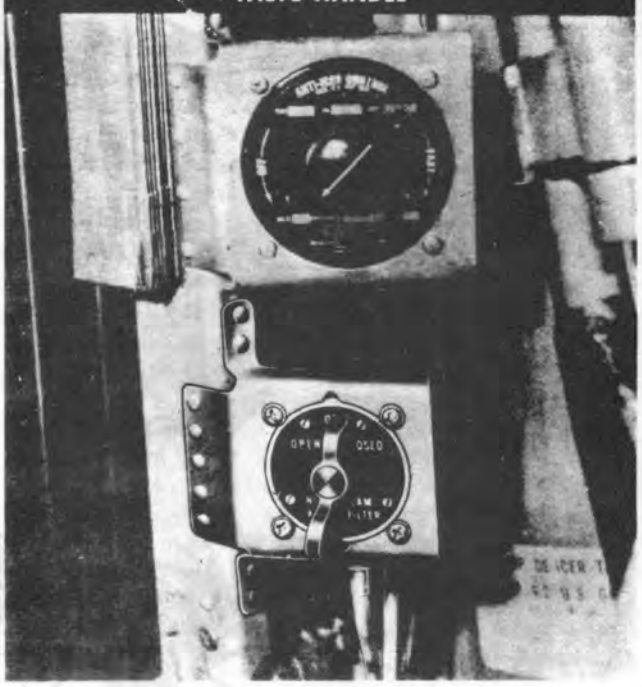


Figure 1-4

CARBURETOR AIR CONTROL LEVERS
LATE AIRCRAFT

1. CARBURETOR AIR CONTROL FRICTION LOCK LEVER.
2. CARBURETOR AIR CONTROL LEVERS.

Figure 1-5

Air Filter Control Handle.
(Some Aircraft)

The ram-nonram carburetor air filter control handle, located on the bulkhead aft of the pilot's seat (figure 1-4), mechanically controls a hydraulic valve that directs the flow of hydraulic pressure for the operation of the ram door and the nonram door in each carburetor airscoop. On some aircraft, this control handle has OPEN (nonram), CLOSED (ram), and OFF positions. On other aircraft, the positions are: FILTERED (nonram), UNFILTERED (ram), and LOCKED. In the OPEN or FILTERED position, the ram door shuts off the ram air flow and the nonram door is opened to allow nonram filtered air to flow to the carburetor, provided the preheat control lever is in the COLD position. In the CLOSED or UNFILTERED position, the nonram door shuts off the nonram filtered air flow and the ram door is opened to permit ram air to flow to the carburetor, provided the preheat control lever is in the COLD position (figure 1-3). When the air filter control handle is placed in a desired position, sufficient time must be allowed for hydraulic actuation before the air filter control handle is returned to OFF or LOCKED to relieve the system pressure. The doors will remain in this position until the control handle is used to select another position.

Carburetor Air Temperature Indicators.

A 28-volt d-c dual carburetor air temperature indicator, graduated in degrees centigrade from -50° to $+150^{\circ}$, is mounted on the main instrument panel (15, figure 1-11, 23, figure 1-12).

Carburetor Air Control Selector Switches (Some Aircraft).

Two rotary, 5-position carburetor air control selector switches, one for each carburetor, are located on the left side of the cockpit immediately aft of the main instrument panel. Each switch has the following positions: HOT AIR, OFF, FULL COLD, FILTER, and FULL COLD. The HOT AIR position of the switch energizes a 28-volt d-c motor which, through a cam and cable system, closes the aft (nonram) door and the induction valve (forward) door to shut off the ram air supply admitting preheated air to the carburetor (figure 1-3). The FULL COLD positions of the switch energizes the motor to close the aft (non-ram) door and the induction valve door to shut off the preheated air supply, admitting ram airflow to the carburetor. The FILTER position of the switch energizes the motor to position the induction valve door to shut off the flow of ram and preheated air, and open the aft (non-ram) door to supply filtered non-ram air to the carburetor. The OFF position opens the circuit to deenergize the motor. The electrical circuit for the motor incorporates micro and limit switches which automatically shut off the motor when the doors are properly positioned for the selected airflow.

COWL FLAPS.

All company operated aircraft have fixed cowl flaps.

IGNITION SYSTEM.

The ignition system consists of two magnetos, installed in the rear accessory section of each engine, which distribute the current to the spark plugs through ignition switches, wiring, and a high tension ignition harness.

Ignition Switches.

The ignition switch unit is located above the vee of the windshield (6, figure 1-6) and incorporates a master ON-OFF switch and an ignition switch for each engine. Each engine ignition switch has four positions: OFF, L, R, and BOTH. The master ON-OFF switch grounds out all four magnetos (both magnetos of each engine) when in the OFF position. The ON position leaves the control of the magnetos to each engine ignition switch. When the engine ignition switch is positioned to L, the left magneto provides ignition for the rear spark plugs and the right magneto is grounded. When the engine ignition switch is positioned to R, the right magneto provides ignition for the front spark plugs and the left magneto is grounded. When the engine ignition switch is positioned to OFF, both magnetos for that engine are grounded and both front and rear spark plugs will not fire. When the ignition switch is in the BOTH position, both magnetos for that engine are able to generate current for the ignition system and all spark plugs can fire.

PRIMING SYSTEM.

The priming system functions as an aid in starting the engines by injecting fuel from a primer line into the blower throat.

Primer Switch (C-47 and C-117 Series Aircraft).

A 3-position, 28-volt d-c engine primer switch, mounted on the electrical control panel (15, figure 1-13), is a momentary-type switch spring loaded to the OFF position. The RIGHT (down) position of the switch energizes the right engine primer solenoid valve to direct fuel under pressure to the right engine for priming. The LEFT (up) position energizes the

left engine primer solenoid valve to direct fuel under pressure to the left engine for priming. The OFF position opens the engine primer circuit. Priming fuel pressure is provided by the booster pumps when the booster pump is ON.

Oil Dilution and Primer Switches (Some Aircraft).

Two 3-position, 28-volt d-c oil dilution and primer switches, one for each engine, are mounted on the electrical control panel (20, figure 1-14). These switches are the momentary-type, spring loaded to the OFF position. When either switch is placed in the ENGINE PRIMER (down) position, the respective engine primer solenoid valve is energized to direct fuel under pressure to the engine for priming. When either switch is held in the OIL DILUTION (up) position, a 28-volt d-c circuit energizes the oil dilution solenoid, and fuel is introduced into the engine oil inlet line for dilution of the engine oil to aid in cold weather starting. Priming fuel pressure is provided by the booster pumps when the booster pump is ON.

STARTING SYSTEM.

A direct cranking or, on some aircraft, a combination inertia-direct-cranking starter with a solenoid meshing device, is mounted on each engine. The starters are operated by switches located in the cockpit.

Starter Switches (Direct Cranking).

Two 2-position starter switches, one for each engine, are mounted on the electrical control panel. The RIGHT switch engages the 28-volt d-c starter for the right engine; the LEFT switch engages the starter for the left engine.

Some aircraft are equipped with one 3-position spring-loaded switch. The down position engages the starter for the RIGHT engine; the up position engages the starter for the left engine. The switch is spring loaded to the off (center) position.

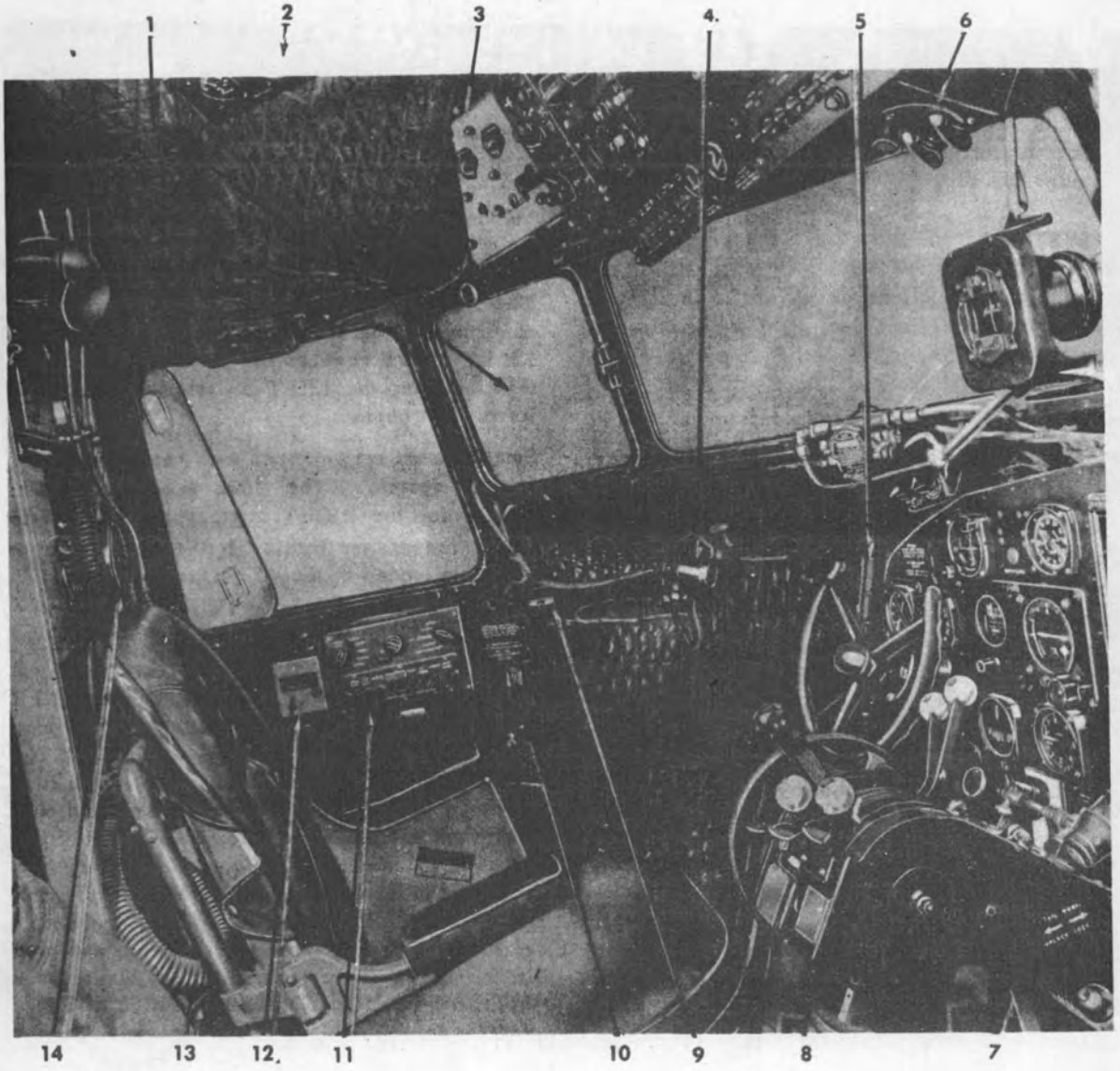
Starter Switches (Inertia-Direct Cranking).

Two 3-position starter switches, one for ENERGIZE and one for MESH, are mounted on the electrical control panel (16, figure 1-13, and 17, 18, figure 1-14). The STARTER ENERGIZE switch is used to energize the 28-volt starter motor and build up sufficient inertia before the STARTER MESH switch is used to energize the solenoid meshing device to engage the starter. Placing the STARTER ENERGIZE switch in the RIGHT (down) position, energizes the starter for the right engine, and placing it in the LEFT (upper) position, energizes the starter for the left engine. Placing the STARTER MESH switch in the RIGHT (down) position meshes the right starter. Placing the STARTER MESH switch in the LEFT (up) position meshes the left starter. Both switches are spring loaded to the OFF (center) position.

ENGINE INSTRUMENTS.

All engine instruments are dual indicating. A direct-reading manifold pressure gage on the main instrument panel indicates the pressure in inches Hg in each engine intake manifold. A 28-volt d-c carburetor air temperature indicator and a self-generated cylinder head temperature indicator (which indicates temperature for the right engine from No. 1 cylinder and for the left engine from No. 13 cylinder), all calibrated in degrees centigrade, are mounted on the main instrument panel (13, 15, figure 1-11, and 23, 27, figure 1-12). A self-generated tachometer is installed on the main instrument panel.

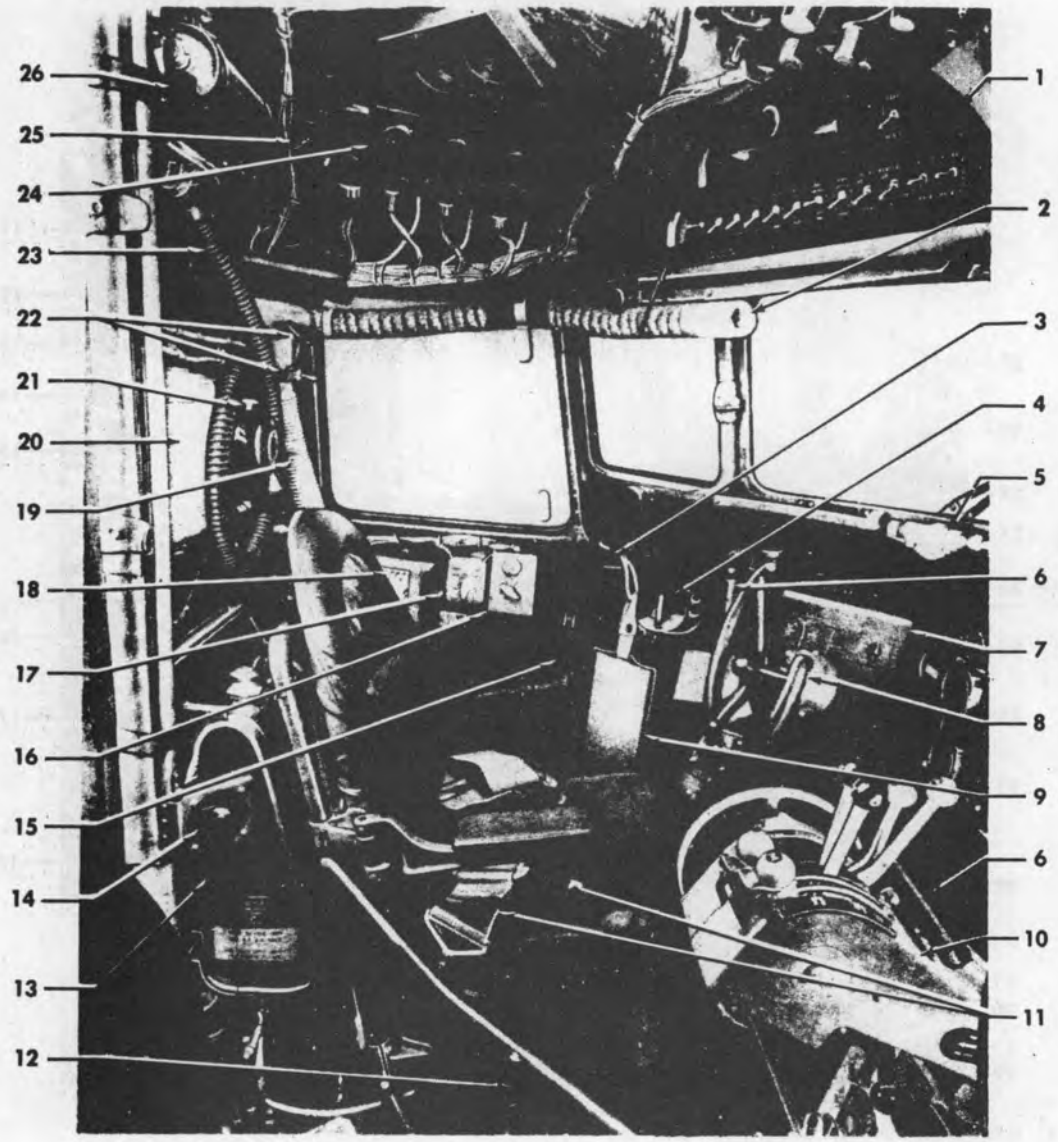
COCKPIT ARRANGEMENT—TYPICAL
LEFT SIDE



1. CLEAR VISION WINDOWS
2. OXYGEN PRESSURE GAGE AND FLOW INDICATOR
3. LEFT ELECTRICAL PANEL
4. FLUORESCENT INSTRUMENT PANEL LIGHT
5. WING FLAP POSITION INDICATOR
6. IGNITION SWITCHES
7. TAIL WHEEL LOCK LEVER
8. THROTTLE FRICTION LOCK
9. SHIELDED MAP READING LIGHT
10. WINDSHIELD ALCOHOL DE-ICING VALVE CONTROL HANDLE
11. INTERPHONE CONTROL PANEL
12. RADIO FILTER
13. PROPELLER DE-ICER RHEOSTAT SHUTOFF VALVE AND TANK
14. OXYGEN FLOW REGULATOR

Figure 1-6

COCKPIT ARRANGEMENT—TYPICAL
LEFT SIDE R4D SERIES AIRCRAFT



1. ELECTRICAL CONTROL PANEL
2. WINDSHIELD DEFROSTER HOSE
3. SHIELDED LAMP
4. SUPERCHARGER HANDLE (SOME AIRCRAFT)
5. WINDSHIELD WIPER OPERATING MECHANISM
6. FLUORESCENT LAMP
7. CARBURETOR AIR CONTROL SELECTOR
8. CONTROL WHEEL
9. PILOT'S CHECK LIST
10. CONTROL PEDESTAL
11. SEAT AND SAFETY BELT
12. FORWARD AND AFT SEAT ADJUSTING CONTROL
13. PROPELLER DE-ICING FLUID SUPPLY TANK
14. PROPELLER DE-ICING RHEOSTAT
15. WINDSHIELD DE-ICING CONTROL VALVE HANDLE
16. INTERPHONE JUNCTION BOX
17. RADIO FILTER BOX
18. SUIT HEAT RHEOSTAT
19. FLEXIBLE HAND WARMER AND DEFROSTER HOSE
20. FUEL SYSTEM FLOW DIAGRAM
21. OXYGEN REGULATOR
22. WINDSHIELD DEFROSTER AND HAND WARMER CONTROL VALVE HANDLES
23. OXYGEN REGULATOR TO MASK HOSE
24. COMMAND RECEIVER PANEL CONTROL HEAD
25. COMMAND TRANSMITTER CONTROL PANEL
26. HAND FIRE EXTINGUISHER

Figure 1-8

CONTROL PEDESTAL — TYPICAL

1. PROPELLER CONTROL LEVERS
2. THROTTLE LEVERS
3. MIXTURE CONTROL LEVERS
4. CARBURETOR AIR CONTROL LEVERS
5. RIGHT ENGINE FUEL TANK SELECTOR
6. THROTTLE LEVER FRICTION LOCK
7. PARKING BRAKE CONTROL KNOB
8. AILERON TRIM TAB CRANK AND INDICATOR
9. CROSS-FEED CONTROL VALVE HANDLE (SOME A MODELS)
10. AUTOPILOT CONTROL VALVE HANDLE
11. RUDDER TRIM CRANK AND INDICATOR
12. TAIL WHEEL LOCK LEVER
13. LEFT ENGINE FUEL TANK SELECTOR
14. ELEVATOR TRIM TAB WHEEL AND INDICATOR

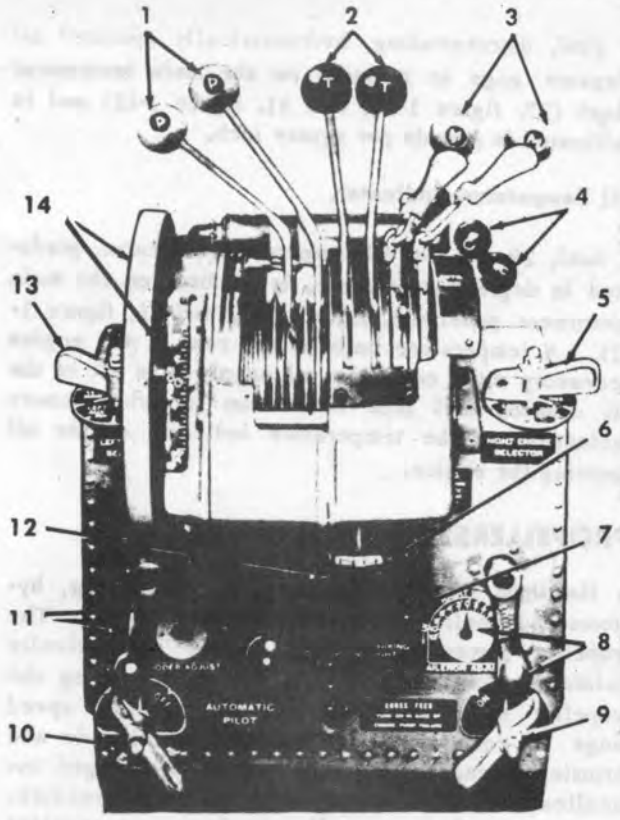


Figure 1-10

MANIFOLD

PRESSURE INDICATING SYSTEM: The pressure indicated on the manifold pressure gages, located on the center of the instrument panel, is taken from the intake manifold of each engine. The direct reading dual gage measures the amount of pressure in inches of mercury, and a piping system connects the gage to the blower case on each engine. A selector valve, located on the back of the instrument panel and controlled by a single handle control on the instrument panel, provides for bleeding of moisture from both the instrument and engine piping during engine warmup. This selector valve also provides for reversing the reading of the dual manifold pressure gage as a check to determine whether or not a faulty gage is causing an incorrect reading. For example, with both engines operating, if the gage pointer marked L for LEFT ENGINE is showing a low reading, the selector valve handle may be moved to OPPOSITE ENGINE. If the L gage pointer still shows a low reading, it is an indication that the manifold pressure gage is faulty. However, if the L gage pointer now shows a normal reading and the R gage pointer drops to a low reading, it is an indication that the manifold pressure for the left engine is low.

CAUTION

Do not attempt to bleed moisture from the instrument or the engine piping with engine manifold pressure above barometric pressure. If above barometric pressure, the lines will fill rather than bleed, and possible fuel spillage behind the main instrument panel will result in a fire hazard.

Fuel Pressure Gage.

A dual, direct-reading, hydrostatically operated, fuel pressure gage is mounted on the main instrument panel (26, figure 1-11, and 30, figure 1-12), and is calibrated in pounds per square inch. Two lines connected to the fuel pressure gage in the cockpit connect to each carburetor.

Oil Pressure Gage.

A dual, direct-reading, hydrostatically operated oil pressure gage is mounted on the main instrument panel (27, figure 1-11, and 31, figure 1-12) and is calibrated in pounds per square inch.

Oil Temperature Indicator.

A dual, 28-volt d-c oil temperature indicator, graduated in degrees centigrade, is mounted on the main instrument panel (25, figure 1-11, and 16, figure 1-12). A temperature bulb on the rear of the engine accessory case or in the oil supply pipe aft of the oil dilution fuel pipe connection furnishes remote indication to the temperature indicator of the oil entering the engine.

PROPELLERS.

A Hamilton Standard 3-bladed, full-feathering, hydromatic propeller is provided for each engine. The propeller governor on each engine automatically maintains constant engine speed by changing the propeller blade angle through the constant speed range to compensate for changes in altitude and throttle setting. The blade angle is changed hydraulically by the flow of engine oil under pressure. The engine oil for propeller feathering is supplied from a reserve in the bottom of the oil tank, and pressure is provided by a 28-volt d-c propeller feathering pump.

PROPELLER CONTROL LEVERS.

Two propeller control levers, located on the control pedestal (1, figure 1-10), through mechanical linkage provide for adjustment of the propeller governor on the nose section of each engine. The control levers have INCREASE (high rpm) and DECREASE (low rpm) placarded positions. Intermediate positions of the levers are used to regulate rpm as desired. The governors maintain constant propeller speed, as selected by the control levers.

PROPELLER FEATHERING SYSTEM

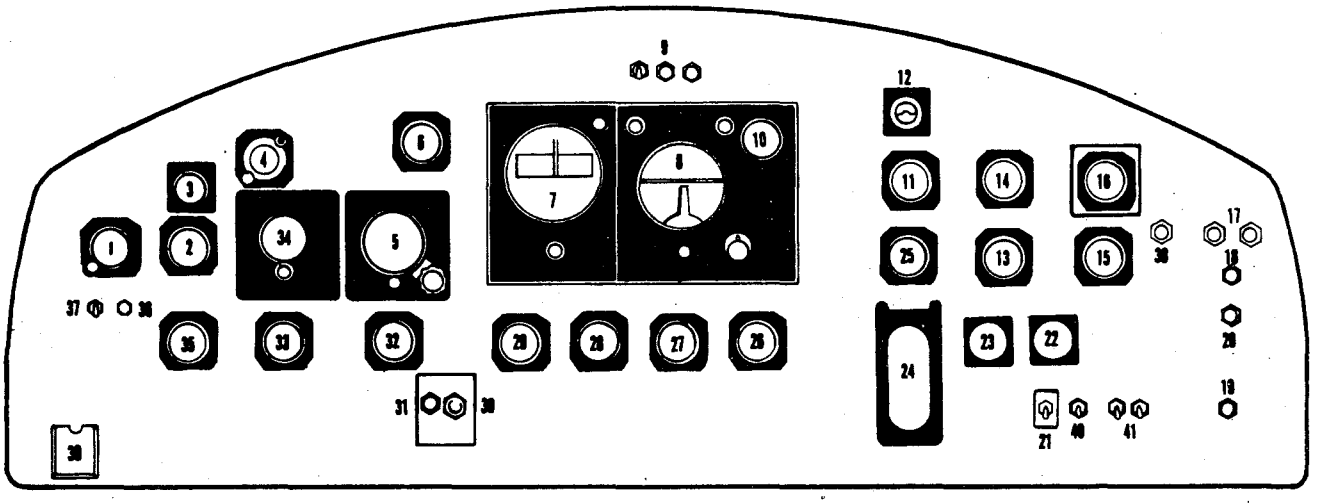
Two push button propeller feathering switches, one for each propeller system, are mounted on the electrical control panel (17, 18, Figure 1-13, and 3, 9, Figure 1-14). Each switch is used in conjunction with a propeller feathering relay and a feathering pump motor. When either propeller feathering switch is pushed IN to feather a propeller, the control relay connects the feathering pump motor to the 24 volts DC main bus in the firewall junction box. At the same time, a holding coil in the switch is grounded and holds the switch IN until the propeller reaches the feathered position, causing the oil pressure to build up sufficiently to open the pressure limit switch and de-energize the holding coil. When the holding coil is de-energized, the feathering button pops out and the feathering pump motor and relay are de-energized. The feathering operation may be interrupted by manually pulling out the feathering switch. Since greater oil pressure is required to unfeather the propeller, the pressure limit switch remains open; therefore, the feathering switch must be held closed to unfeather the propeller. When the propeller feathering button is depressed to unfeather the propeller, it must be held in manually until the propeller blades have moved out of the feathered position and approximately 800 RPM is indicated on the tachometer. Due to the importance of the propeller feathering circuit, no circuit protective devices are provided on most aircraft. Oil for propeller feathering is taken from a reserve in the main oil supply tank, outside of the hopper tank.

CAUTION

If the feathering button fails to pop out after the propeller has reached the feathered position, it must be pulled out manually or the propeller will unfeather and possible overspeed.

MAIN INSTRUMENT PANEL—TYPICAL

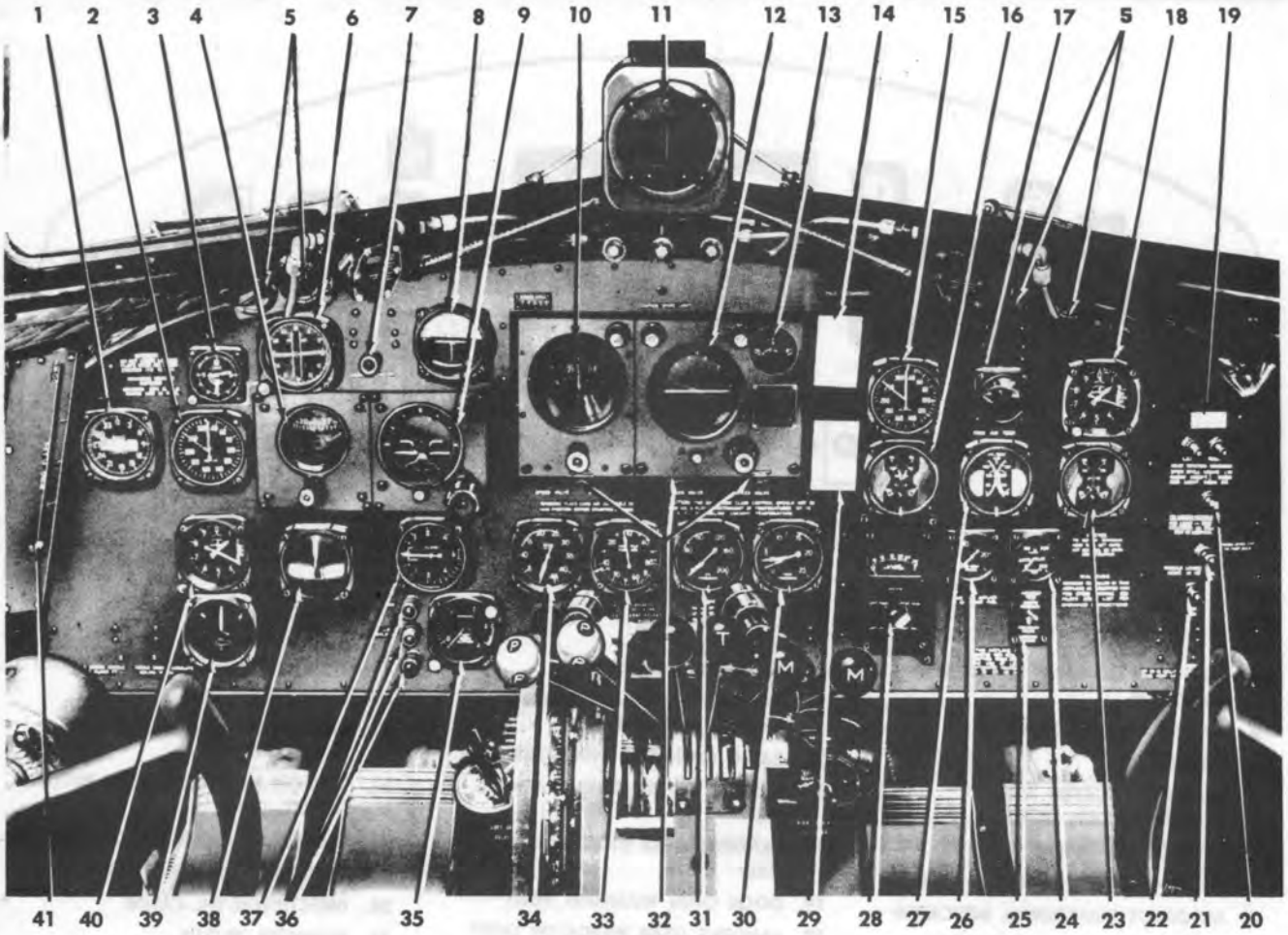
C-47 AND C-117 SERIES AIRCRAFT



1. FLUX GATE COMPASS REPEATER INDICATOR
2. AIRSPEED INDICATOR, PILOT'S
3. CLOCK
4. COURSE INDICATOR AND MARKER BEACON LIGHT
5. ATTITUDE INDICATOR
6. RADIO MAGNETIC INDICATOR (RMI)
7. AUTOPILOT DIRECTIONAL INDICATOR
8. AUTOPILOT ATTITUDE INDICATOR
9. ENGINE FIRE DETECTION WARNING LIGHTS AND TEST SWITCH
10. AUTOPILOT VACUUM GAGE
11. AIRSPEED INDICATOR, CO-PILOT'S
12. FREE AIR TEMPERATURE INDICATOR
13. CYLINDER HEAD TEMPERATURE INDICATOR (DUAL)
14. ALTIMETER, CO-PILOT'S
15. CARBURETOR AIR TEMPERATURE INDICATOR (DUAL)
16. RADIO MAGNETIC INDICATOR (RMI)
17. CRITICAL TEMPERATURE WARNING LIGHTS
18. LANDING GEAR INDICATOR LIGHT (RED)
19. DOOR OPEN WARNING LIGHT
20. LANDING GEAR INDICATOR LIGHT (GREEN)
21. STATIC PRESSURE SELECTOR VALVE
22. AUTOPILOT OIL PRESSURE GAGE
23. DE-ICING SYSTEM PRESSURE GAGE
24. FUEL QUANTITY INDICATOR
25. OIL TEMPERATURE INDICATOR (DUAL)
26. FUEL PRESSURE GAGE (DUAL)
27. OIL PRESSURE GAGE (DUAL)
28. MANIFOLD PRESSURE GAGE (DUAL)
29. TACHOMETER (DUAL)
30. CARBON MONOXIDE WARNING LIGHT (C-117)
31. CARBON MONOXIDE RESET BUTTON (C-117)
32. VERTICAL VELOCITY INDICATOR
33. TURN-AND-SLIP INDICATOR
34. DIRECTIONAL INDICATOR
35. ALTIMETER, PILOT'S
36. FLUX GATE COMPASS WARNING LIGHT
37. FLUX GATE COMPASS CAGING SWITCH
38. HEAT SYSTEM WARNING LIGHT
39. ALTIMETER CORRECTION CARD
40. FUEL CROSSFEED SWITCH
41. FUEL DUMP SWITCHES

Figure 1-11

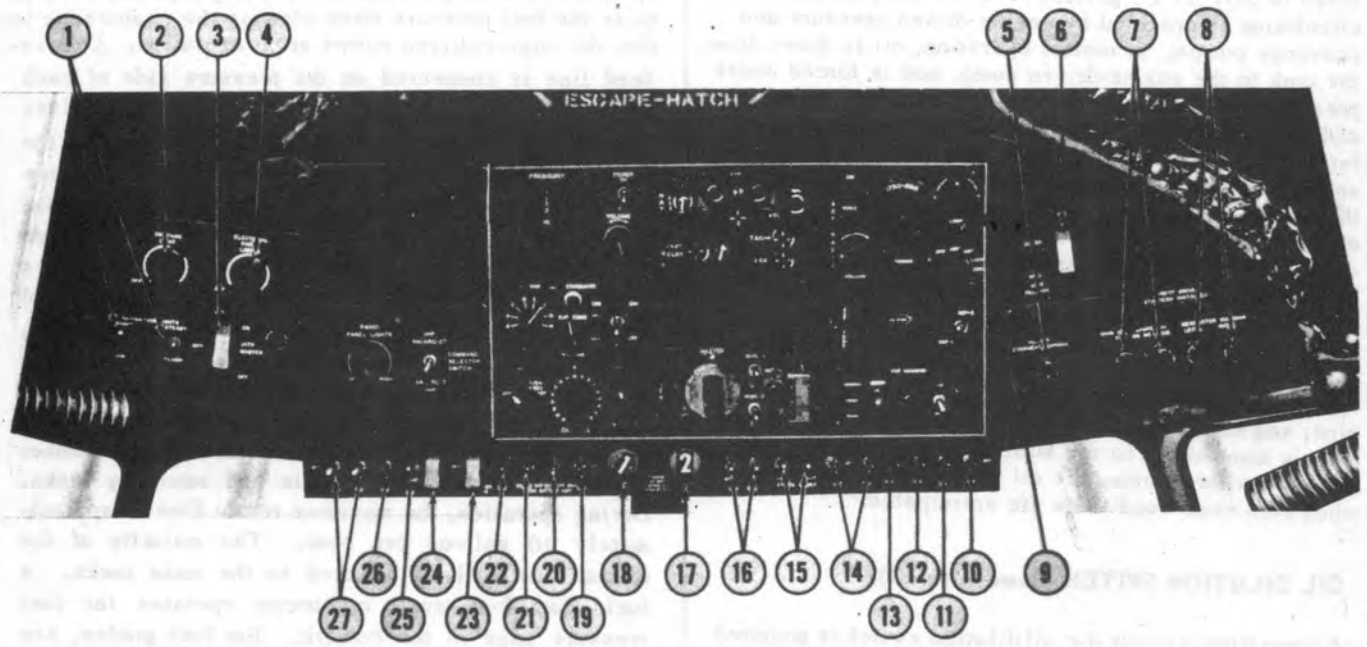
MAIN INSTRUMENT PANEL—TYPICAL
R4D SERIES AIRCRAFT



1. RADIO MAGNETIC INDICATOR (RMI)
2. AIRSPEED INDICATOR (PILOT'S)
3. CLOCK
4. DIRECTIONAL INDICATOR
5. FLUORESCENT LIGHT SWITCHES
6. REMOTE COMPASS INDICATOR
7. MARKER BEACON INDICATOR LIGHT
8. GLIDE SLOPE AND COURSE INDICATOR
9. ATTITUDE INDICATOR
10. AUTOPILOT DIRECTIONAL INDICATOR
11. MAGNETIC (STANDBY) COMPASS
12. AUTOPILOT ATTITUDE INDICATOR
13. AUTOPILOT VACUUM GAGE
14. COMPASS CORRECTION CARD
15. AIRSPEED INDICATOR (CO-PILOT'S)
16. OIL TEMPERATURE INDICATOR (DUAL)
17. FREE AIR TEMPERATURE INDICATOR
18. ALTIMETER (CO-PILOT'S)
19. CRITICAL TEMPERATURE WARNING LIGHTS
20. LANDING GEAR INDICATOR LIGHT (RED)
21. LANDING GEAR INDICATOR LIGHT (GREEN)
22. DOOR-OPEN WARNING LIGHT
23. CARBURETOR AIR TEMPERATURE INDICATOR (DUAL)
24. AUTOPILOT OIL PRESSURE GAGE
25. STATIC PRESSURE SELECTOR VALVE SWITCH
26. DE-ICING SYSTEM PRESSURE GAGE
27. CYLINDER HEAD TEMPERATURE INDICATOR (DUAL)
28. FUEL QUANTITY INDICATOR
29. REMOTE COMPASS CORRECTION CARD
30. FUEL PRESSURE GAGE (DUAL)
31. OIL PRESSURE GAGE (DUAL)
32. AUTOPILOT SPEED CONTROL VALVE KNOBS
33. MANIFOLD PRESSURE GAGE (DUAL)
34. TACHOMETER (DUAL)
35. RADIO ALTIMETER
36. ALTITUDE LIMIT INDICATOR LIGHTS
37. VERTICAL VELOCITY INDICATOR
38. TURN-AND-SLIP INDICATOR
39. ALTITUDE LIMIT INDICATOR
40. ALTIMETER (PILOT'S)
41. WING FLAP POSITION INDICATOR

Figure 1-12

ELECTRICAL CONTROL PANELS – TYPICAL



1. NAVIGATION LIGHTS SWITCH
2. COMPASS LIGHT RHEOSTAT
3. JATO MASTER SWITCH
4. ELECTRICAL PANEL LIGHTS RHEOSTAT
5. HEATER OVERHEAT WARNING LIGHT
6. JATO RELEASE SWITCH
7. MAIN INVERTER FAIL WARNING LIGHT
8. GENERATOR FAILURE WARNING LIGHTS
9. RADIO CONTROL PANEL
10. AFT PITOT HEATER SWITCH
11. FORWARD PITOT HEATER SWITCH
12. PROP DEICER SWITCH
13. CARB. AND WINDSHIELD DEICER SWITCH
14. BOOSTER PUMP SWITCHES
15. OIL DILUTION AND ENGINE PRIMER SWITCHES
16. STARTER SWITCHES
17. RIGHT ENGINE PROP FEATHERING SWITCH
18. LEFT ENGINE PROP FEATHERING SWITCH
19. BATTERY MASTER SWITCH
20. EMERGENCY POWER SWITCH
21. COCKPIT LIGHTS SWITCH
22. ANTI-COLLISION LIGHT SWITCH
23. PARAPACK SALVO SWITCH
24. BAILOUT WARNING SWITCH
25. JUMP WARNING SWITCH
26. PASSING LIGHTS SWITCH
27. LANDING LIGHTS SWITCHES

Figure 1-13

OIL SYSTEM.

Each engine has an independent oil system that incorporates and oil tank with an internal hopper tank and an oil cooler. The tank has a capacity of 29 US gallons, of which 3 gallons are reserved in the bottom of the tank for propeller feathering only. The tanks should be filled to only 25 US gallons to allow for expansion. Oil circulation is provided by engine-driven pressure and scavenge pumps. In normal operation, oil is drawn from the tank to the engine-driven pump, and is forced under pressure to all parts of the engine requiring lubrication and then drops to the engine sump. A scavenge pump forces this oil out of the engine to the oil cooler, where under normal conditions, it passes through the core of the cooler. From the cooler, the oil returns to the top of the oil tank. On cold starts, the oil bypasses the cooler until a minimum temperature is reached. The quantity of oil flowing through the cooler is automatically regulated by the thermostatic control. The oil returning to the tank enters the top of a hopper, the bottom of which is located above the tank outlet fitting. This arrangement permits the warm oil to return to the engine, and as the warm oil flows through the hopper, the heat is transmitted to the surrounding oil in the tank. Provisions for diluting the oil with fuel are provided when cold start conditions are anticipated.

OIL DILUTION SWITCH (Some Aircraft).

A 3-position, 28-volt d-c oil dilution switch is mounted on the electrical control panel (15, figure 1-13 and 20, figure 1-14) and has LEFT, RIGHT, and OFF positions. When the switch is held in the LEFT position, a 28-volt d-c circuit energizes the oil dilution solenoid and fuel is introduced into the oil of the left engine to aid in cold-weather starting. When the switch is held in the RIGHT position, engine oil is diluted for the right engine in the same manner. The switch is spring loaded to the OFF position.

OIL DILUTION AND PRIMER SWITCHES (Some Aircraft).

Refer to the paragraph on Oil Dilution and Primer Switches under Priming System, this Section.

FIREWALL SHUTOFF VALVES.

See the paragraph on Firewall Shutoff Valve Handles, this section.

FUEL SYSTEM.

Fuel is supplied from two main tanks and two auxiliary tanks installed in the center wing section (figure 1-16). The fuel quantity is measured by a 28-volt liquidometer system and indicated by the fuel quantity indicator in the cockpit. During normal operation, the left engine is supplied by fuel from the left tanks, and the right engine by the right tanks; however, by using the fuel tank selectors in the cockpit, fuel may be supplied from any tank to either engine. On eariler model aircraft lines lead from the selector valves to the two wobble pumps which are hand-operated by a single control. These pumps are used to raise the fuel pressure when starting the engines, or before the engine-driven pumps are in operation. A cross-feed line is connected on the pressure side of each engine-driven pump, and the two cross-feed valves in this line are operated by a single control in the cockpit. The cross-feed system enables both engines to receive fuel from one engine-driven pump in case either pump fails. On late aircraft, the wobble pumps are replaced by two electric booster pumps with a control switch located on the electrical control panel. On aircraft equipped with booster pumps, there is no cross-feed system. The booster pumps will furnish ample pressure and fuel supply for operation in case either engine-driven pump fails. A vapor overflow line connects from the top chamber of the carburetor to the main and auxiliary tanks. During operation, the maximum return flow is approximately 10 gallons per hour. The majority of the return flow will be directed to the main tanks. A fuel line from each carburetor operates the fuel pressure gage in the cockpit. For fuel grades, see figure 1-30; for fuel grade operating limits, refer to Section V, Operating Limitations. See figure 1-15 for Fuel Quantity Data.

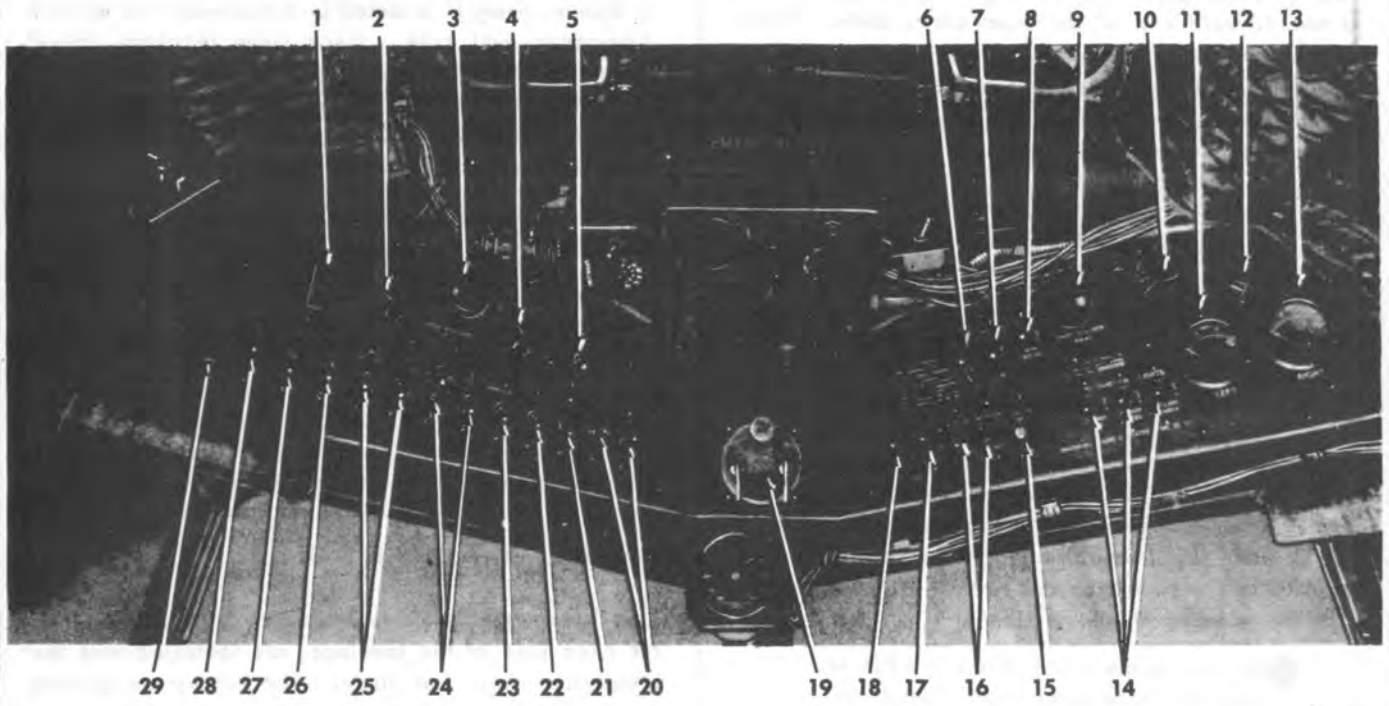
Fuel Tank Selectors.

Two fuel tank selectors, one for each engine, are mounted on the left and right sides of the control pedestal (5, 13, figure 1-10). Each selector has LEFT AUX, LEFT MAIN, RIGHT MAIN, RIGHT AUX, and OFF positions. The selectors are connected mechanically to the valves by rods and cables. When the selector is placed in any position, fuel will be supplied from the tank corresponding to that position.

Fuel Booster Pump Switches.

The 28-volt d-c electrically driven booster pumps are energized by the two booster pump ON-OFF switches mounted on the electrical control panel (14, figure 1-13, and 16, figure 1-14). Positioning either switch to ON completes the 28-volt d-c circuit to its respective booster pump motor.

ELECTRICAL CONTROL PANEL—TYPICAL
R4D SERIES AIRCRAFT



1. BAIL-OUT SWITCH
2. COMPASS LIGHT RHEOSTAT
3. LEFT PROPELLER FEATHERING CONTROL
4. INSTRUMENT PANEL LIGHTS RHEOSTAT
5. PROPELLER DE-ICER SWITCH
6. PILOTS' COMPARTMENT LIGHTS
7. INVERTER SWITCH
8. CARBURETOR DE-ICER SWITCH
9. RIGHT PROPELLER FEATHERING CONTROL
10. FORMATION LIGHTS RHEOSTAT
11. LEFT AMMETER
12. PANEL LIGHT
13. RIGHT AMMETER
14. RECOGNITION LIGHT SWITCHES
15. KEYING SWITCH
16. FUEL BOOSTER PUMP SWITCHES
17. STARTER MESH SWITCH
18. STARTER ENERGIZE SWITCH
19. IGNITION SWITCHES
20. ENGINE OIL DILUTION AND PRIMER SWITCH
21. PITOT HEATER SWITCH (AFT)
22. PITOT HEATER SWITCH (FORWARD)
23. WINDSHIELD DE-ICER SWITCH
24. POSITION LIGHTS SWITCHES
25. LANDING LIGHTS SWITCHES
26. PASSING LIGHT SWITCH
27. BATTERY MASTER SWITCH
28. CAUTION JUMP LIGHT SWITCH
29. PARA PACK SALVO SWITCH

Figure 1-14

Fuel Quantity Indicator.

A 28-volt d-c liquidometer fuel quantity indicator is installed on the main instrument panel (24, figure 1-11), and 28, figure 1-12) to indicate the fuel quantity in the two main and two auxiliary tanks. A selector handle on the indicator has LEFT AUX, LEFT MAIN, RIGHT MAIN, and RIGHT AUX position. As the selector is moved from one position to another, the calibrated dial for the new position flips up into the window of the indicator and the quantity of fuel in the corresponding tank may be read.

CAUTION

The selector must be turned clockwise to prevent jamming.

LONG-RANGE FUEL SYSTEM (Some Aircraft).

On some aircraft, provisions have been made for two, long-range fuel tanks. The tanks have a 500 gal. capacity and are installed on cradles at the forward end of the main cargo compartment, one on each side. The tanks are cylindrical metal, non-selfsealing.

WARNING

Due to the slope of the main cargo compartment floor when the aircraft is on the ground, the long-range fuel tank capacity is limited to 385 gallons each (380 gallons of usable fuel).

Each tank is provided with a booster pump, vent, filler, drain, and fuel line connections. Two manually operated globe valves (figure 1-17) are located at the forward end of the main cargo floor. These valves are so arranged that they may be used as selector valves or as shutoff valves, and fuel from either tank may be diverted to either engine, or both, or turned off completely.

WARNING

- The main fuel tank selector valves must be in the OFF position, when the long-range fuel system is being used, to prevent gravity fuel flow or fuel under booster pump pressure from overflowing the main fuel tanks. When the long-range fuel tanks are empty, the valves must be in the OFF position or air will be drawn from the long range tanks, causing air locks in the fuel system.
- Do not operate the aircraft APP at anytime long-range fuel tanks are installed to preclude possibility of fire.

FUEL QUANTITY DATA CHART

GALLONS

TANK	NUMBER OF TANKS	USABLE FUEL (EACH)	FUEL SERVICE (EACH)
MAIN	2	202.0	204.0
AUXILIARY	2	199.0	200.0

TOTAL USABLE FUEL..... 802 GALLONS
LONG-RANGE FUEL TANKS ..... 385 GALLONS EACH
INSTALLATION OF TWO TANKS POSSIBLE
TOTAL USABLE FUEL IN EACH
LONG RANGE FUEL TANK ..... 380 GALLONS

Note: Level flight assumed to be 3 degrees nose up.

Figure 1-15

LONG RANGE FUEL TANKS BOOSTER PUMPS (Some Aircraft).

A booster pump is mounted in the forward end of each long-range fuel tank. Each pump receives 28-volt d-c power from the main electrical junction box, and is operated by an ON, OFF switch on the fuel pump control panel, mounted on the aft side of the main cargo compartment forward bulkhead.

LONG-RANGE FUEL TANK DUMP VALVE (Some Aircraft).

The manually operated long-range fuel tank dump valve is installed in the fuel dump line on the right side of the catwalk between the long-range fuel tanks. The dump valve is normally safety-wired CLOSED. When the valve is moved to the OPEN position, fuel will be dumped overboard, either under booster pump pressure or gravity flow.

Long-Range Fuel Shutoff Valves.

Two long-range fuel shutoff valves (figure 1-17), one for each side of the fuselage, are installed with the long-range tanks and lines. The valves are located in front of and between the front two long-range tanks in the main cabin compartment. The valves may be opened manually by rotating the handles in a counterclockwise direction.

WARNING

Do not operate internally installed auxiliary power plant at any time long-range auxiliary fuel tanks are installed.

FIREWALL SHUTOFF VALVES.

See the paragraph on Firewall Shutoff Valve Handles, this section.

FUEL SYSTEM (Some HC-47 Aircraft).

Fuel is supplied from two main tanks, two auxiliary tanks, and four wing tanks. The main and auxiliary tanks are installed in the center wing section, and the elliptical drum type metal wing tanks are installed in each outer wing panel on each side of the center spar between the rear and front spar; these two tanks are connected with an equalizing line on the bottom inboard end which allows the tanks to

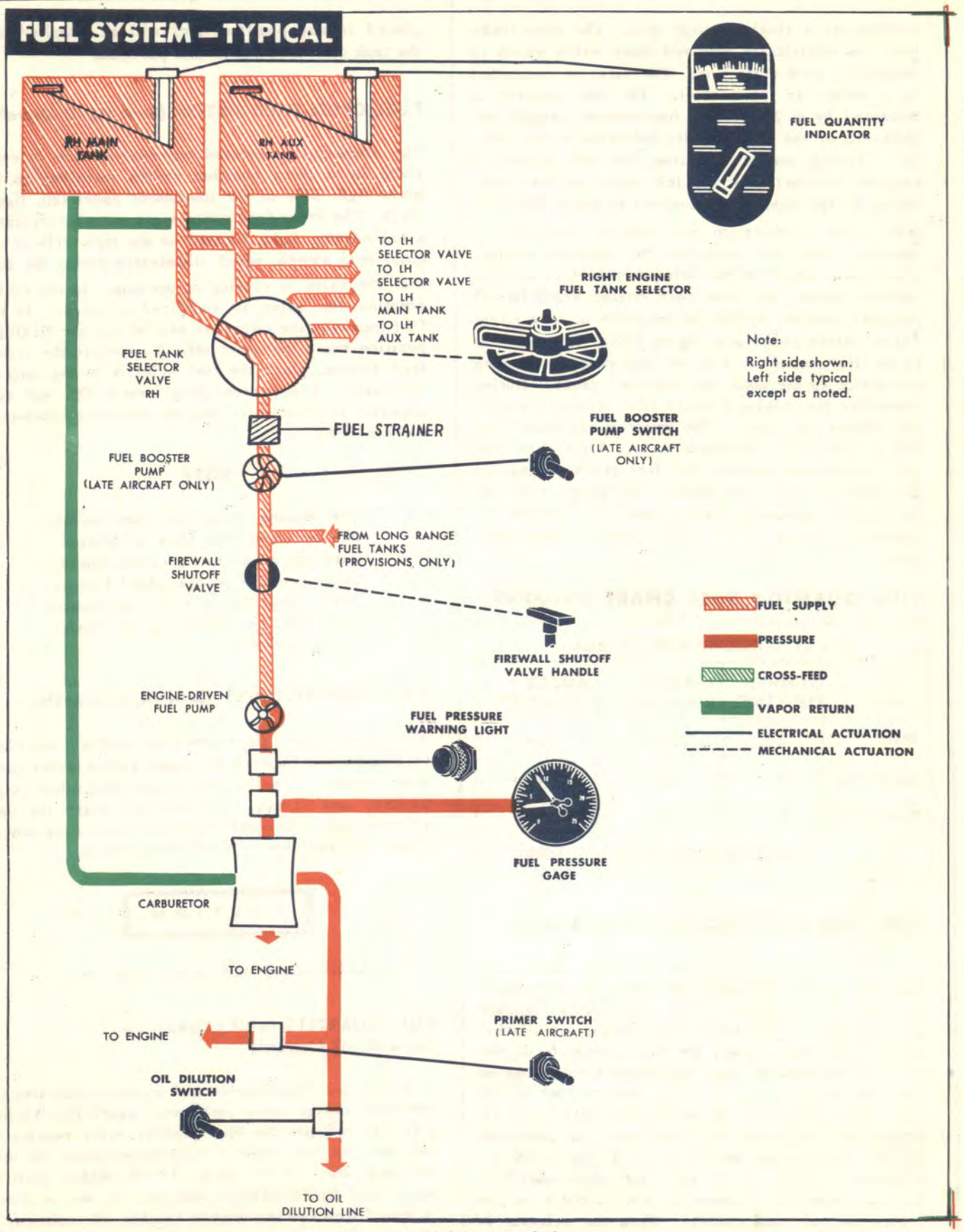


Figure 1-16 (Sheet 1 of 2)

function as a single storage unit. The wing tanks have an electrically operated dump valve which is located in each dump line. The valve is controlled by a switch in the cockpit. The fuel quantity is measured by a 28-volt d-c liquidometer system and indicated by the fuel quantity indicator in the cockpit. During normal operation, the left engine is supplied by fuel from the left tanks and the right engine by the right tanks; however by using the cross feed valve controls in the cockpit, fuel may be supplied from one wing to the opposite engine. Fuel lines lead from the selector valves to the two booster pumps, one from each engine, which furnish pressure and fuel supply for operation in case either engine driven pump fails (figure 1-16). A vapor vent return line connects from the top chamber of each carubretor to the main and auxiliary tanks. During operation, the maximum return flow is approximately 10 gallons per hour. The majority of return flow will be directed to the main tanks. A fuel line from each carburetor operates the fuel pressure gage in the cockpit. For fuel grades see figure 1-30; for fuel grade operating limits, refer to section V, Operating Limits. For Fuel Quantity Data, see chart.

FUEL QUANTITY DATA CHART-GALLONS.

FULLY SERVICED AND USABLE			
TANK	NUMBER OF TANKS	USABLE FUEL (each)	FULLY SERVICED
Main	2	202	204
Auxiliary	2	199	200
Wing(outer)	4	200	200
TOTAL USABLE FUEL			1602

FUEL TANK SELECTORS (Some HC-47 Aircraft).

Two fuel tank selectors, one for each engine, are mounted on the left and right sides of the control pedestal, (5, 13, figure 1-10). The valves operate independent of each other since with the installation of the outer wing tanks, the fuel system feeds the right engine from the right tanks and the left engine from the left tanks. The right selector has R. H. AUX 200 GALS, R. H. MAIN 202 GALS, R. H. WING 400 GALS and OFF positions. The positions on the left selector are L. H. AUX 200 GALS, L. H. MAIN 202 GALS, L. H. WING 400 GALS and OFF. The selectors are connected mechanically to the valves by rods and cables. When the selector is placed in any position, fuel will be supplied from the tank corresponding to that position.

FUEL CROSS-FEED SWITCH (Some HC-47 Aircraft).

The electrically operated cross-feed valve is energized by a three position switch installed on the lower right side of the instrument panel (40, figure 1-11). The cross-feed switching system incorporates a red warning light, located on the right side of the cross-feed switch, which illuminates during the time that the valve is closing or opening. In the OPEN position the valve is energized to open. In the OFF position the circuit is neutral and the CLOSED position shuts the valve off. To operate the cross-feed system, place the fuel selector to the tank to be used. Place cross-feed switch ON and turn opposite selector valve (engine receiving cross-feed fuel) to OFF.

NOTE

The engine being fed fuel during this operation will show an approximate two pound fuel pressure fluctuation because of the added fittings in the line. The pressure fluctuation will not be sufficient to hinder engine operation.

FUEL DUMP SWITCHES (Some HC-47 Aircraft).

Two 28-volt d-c three position guarded switches (41, figure 1-11) operate the dump valves in the outer wing tanks. The switches are placarded OFF, CLOSE, and DUMP. To dump fuel place the fuel selector valves to tanks other than outer wing tanks. Place both switches to the DUMP position.

CAUTION

Never dump fuel with flaps down.

FUEL QUANTITY INDICATORS. (Some HC-47 Aircraft).

A 28-volt d-c liquidometer fuel quantity indicator is installed in the main instrument panel (24, figure 1-11), to indicate the fuel quantity in the two main and two auxiliary tanks. A selector handle on the indicator has LEFT AUX, LEFT MAIN, RIGHT MAIN, and RIGHT AUX positions. As the selector is moved from one position to another, the calibrated

FUEL SYSTEM (SOME HC-47 AIRCRAFT)

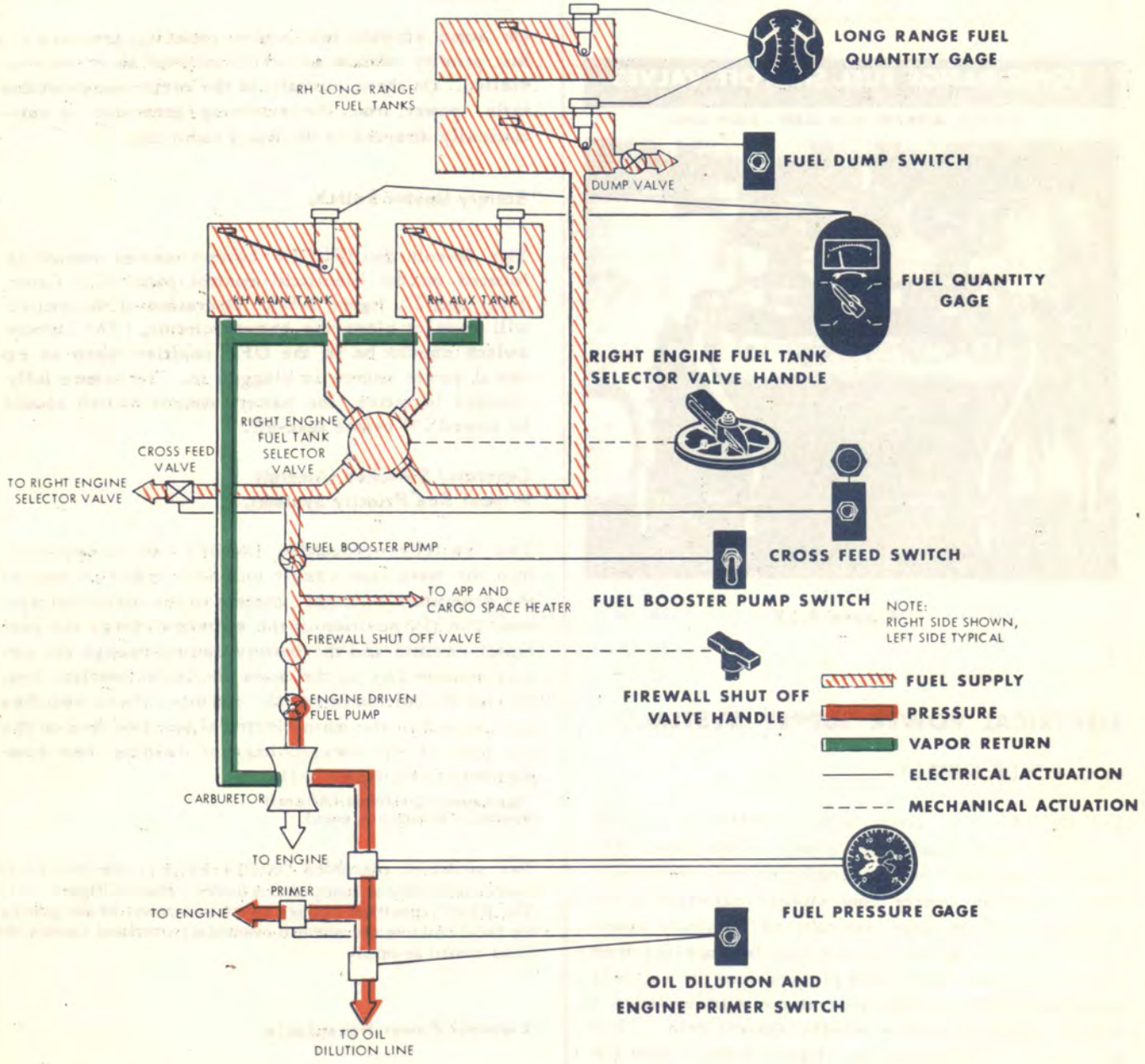


Figure 1-16 (Sheet 2 of 2)

dial for the new position flips up into the window of the indicator and the quantity of fuel in the corresponding tank may be read. A fuel indicator is located on the instrument panel to indicate fuel in either outer wing tank.

NOTE

The outer wing fuel meter will not give an accurate reading when the airplane is on the ground.

LONG-RANGE FUEL SHUTOFF VALVES

LOCATION: FORWARD MAIN CABIN — FLOOR LEVEL

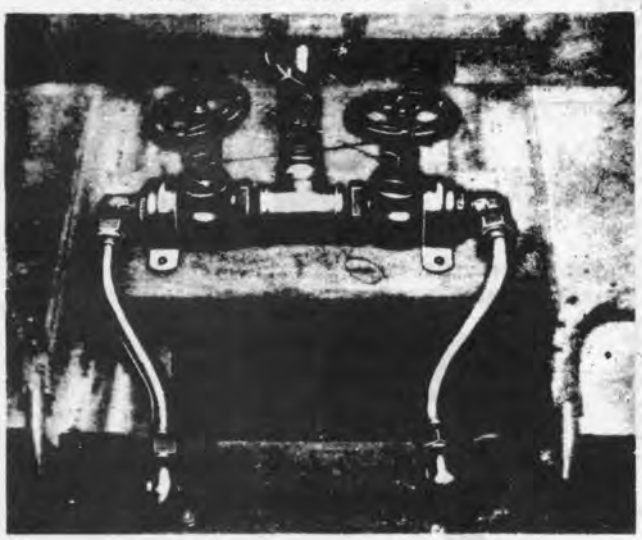


Figure 1-17

ELECTRICAL POWER SUPPLY SYSTEM.

D. C. POWER SUPPLY.

The DC electrical power supply system is a 24 to 28 volt, single conductor, ground return type. DC power is supplied by two engine driven generators, two 12 volt 88 ampere hour storage batteries wired in series and on some aircraft, an auxiliary power plant. On the ground, power may be supplied from an external power unit when plugged into the external power receptacle. Each generator circuit includes a voltage regulator and a reverse current relay. For DC power distribution see figure 1-18. The CB fire extinguishing system, alarm and warning system and the main junction box light circuit are connected directly to the aircraft batteries. On some aircraft, the alarm and warning system is connected to the main junction box bus. Refer to the ALARM SYSTEM and FIRE EXTINGUISHER SYSTEM, this section. Power is supplied to the DC electrically operated equipment through circuit protectors connected to the bus in the main electrical junction box (figure 1-21, and figure 1-22). In case both generators fail, the DC equipment can be supplied by the aircraft batteries when the battery switch is ON. In order to conserve the batteries, only the equipment essential for safe operation of the aircraft should be operated.

On some aircraft two higher capacity generators, a bus priority system and third inverter have been installed. On these aircraft, in the event one generator fails, power from the surviving generator is automatically directed to the No. 1 radio bus.

Battery Master Switch.

The 28-volt d-c ON-OFF battery master switch is located on the electrical control panel (19, figure 1-13, and 27, figure 1-14). Operation of the switch will open or close the battery circuit. The battery switch should be in the OFF position when an external power source is plugged in. To assure fully charged batteries, the battery master switch should be turned ON before take-off.

Generator Switches (Aircraft Without Bus Priority System).

Two switches placarded ON-OFF are incorparted into the main line circuit to select either or both of the generators to supply current to the electrical system. The ON position of the switches closes the generator circuits and the battery circuit through the circuit breaker bus in the main electrical junction box. The OFF position opens the circuits. These switches are located in the main electrical junction box on the aft wall of the forward baggage loading door companionway (19, figure 1-1).

"Generator Switches (Aircraft With Bus Priority System).

Two switches, placarded ON-OFF-RESET, are located on the Main Electrical Junction Box Control Panel (Figure 1-21). The RESET position is used to restore power to the generator field coils in the event a momentary overload causes the field circuit to open.

External Power Receptacle.

A ground power receptacle is located on the underside of the fuselage aft of the batteries (18, figure 1-1), and connects the external d-c power to the aircraft electrical system when the ground power supply is plugged in.

Utility Power Outlet.

Utility power outlets are installed at various locations throughout the aircraft. On some aircraft, one utility power outlet is installed on the left side of the main cargo compartment, immediately forward of the main cargo door. On C-117 series aircraft, two power outlets are installed at the buffet.

Generator Warning Lights.

Two 28-volt d-c generator warning lights, one for each generator, are mounted on the electrical control panel to provide indication of generator failure (8, figure 1-13). On some aircraft, generator warning lights are also located on the power systems junction box control panel, mounted on the aft wall of the forward baggage loading door companionway (figure 1-21). If the output voltage of a generator becomes less than that of the bus, the respective reverse-current relay will prevent current flowing from the bus to the generator and will illuminate the generator warning light for the faulty generator.

GROUND TEST POWER SWITCH (Some Aircraft).

On the aircraft with 200 ampere generators and a priority bus system, the bus priority relay will automatically disconnect the main junction box No. 2 bus and the radio junction box No. 2 bus when either or both generators are not supplying DC power. The Ground Test Power Switch (19, Figure 1-21) will override the priority bus relay in the ON position. Its primary function is to override the priority relay when the aircraft is operating on ground power. The Ground Test Power Switch is located on the Main Electrical Junction Box Control Panel, mounted on the aft wall of the forward baggage loading door compartment.

CAUTION

On aircraft with the UHF communications equipment, cockpit instrument floodlights, marker beacon, windshield defroster motor, and fluxgate compass on the No. 2 buses, the Ground Test Power Switch should be lockwired in the ON position. If a generator fails, the nonessential loads on the DC system must be reduced to below 200 amperes or the remaining generator will fail or drop off the line.

Ammeters.

Two ammeters, one for each generator, are provided to measure the amperage output of the generators (figure 1-18). The ammeters are located on the right side of the electrical control panel (11, 13, figure 1-14). On some aircraft, the ammeters are located on the power systems junction box controls panel, mounted on the aft wall of the forward cargo loading door companionway.

A-C POWER SUPPLY.

Power for operation of various items of electrical and electronics equipment requiring 115 volts, 400 cycles AC power is supplied by an inverter system operated from the DC power system. The AC power is supplied to the equipment through circuit protectors located on the Radio Circuit Breaker Panel (Figure 1-20), and is controlled by switches located on the Electrical Control Panel (See 7, Figure 1-14).

On typical aircraft, two main and one spare inverters have been installed in conjunction with a bus priority system to provide AC power (Figure 1-18). Number 1 and 2 inverters supply power to the number 1 and 2 AC buses respectively. The spare inverter may supply power to either bus in the event one main inverter fails. The inverters are controlled by switches located on the Main Electrical Junction Box Control Panel (Figure 1-21).

On some aircraft, one main and one spare inverter are installed to provide power to the Instrument and number 1 AC power buses (Figure 1-19). The spare inverter may supply power to both buses in the event of failure of the main inverter. On aircraft equipped with a speaker system and ARC-65, an auxiliary inverter has been installed to provide AC power. If the auxiliary inverter fails, this equipment cannot be operated, as no provisions have been made for supplying AC power from the main or spare inverters. The inverters are controlled by switches located on the Main Electrical Junction Box Control Panel (Figure 1-21).

Inverter Switch.

On typical aircraft equipped with a generator inverter and bus priority system, the ON-OFF-SPARE switches for the number 1 and 2 inverters and the ON number 1 and ON number 2 switch for the spare inverters are located on the Main Electrical Junction Box Control Panel, mounted on the aft wall of the forward baggage loading door compartment (Figure 1-21).

On company operated aircraft an ON-MAIN-SPARE inverter switch, located on the electrical control panel (7, figure 1-14) completes the 28-volt DC control circuit to the inverter system when in the ON or SPARE position.

MAIN POWER DISTRIBUTION SCHEMATIC - SOME AIRCRAFT

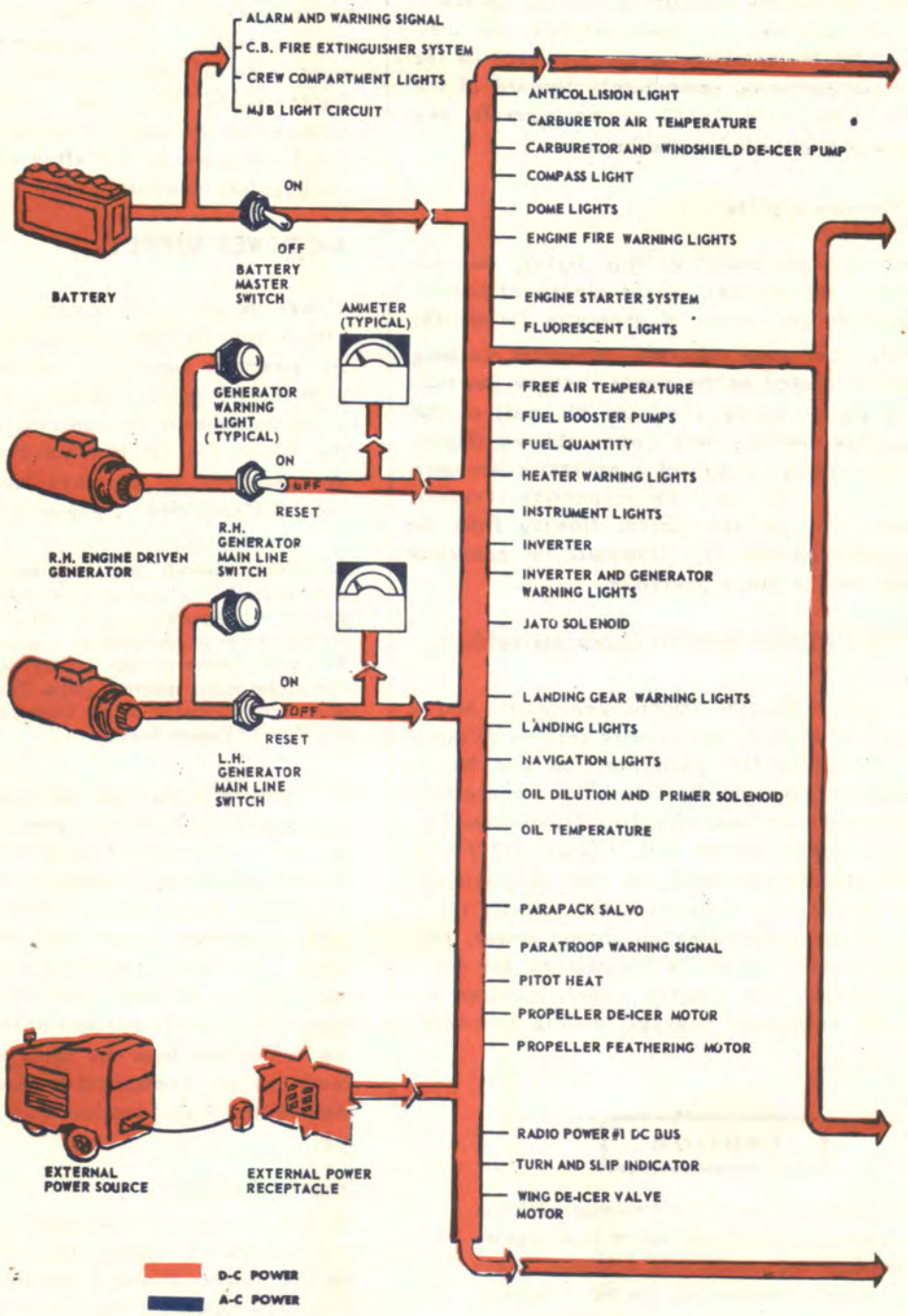


Figure 1-18 (Sheet 1 of 2)

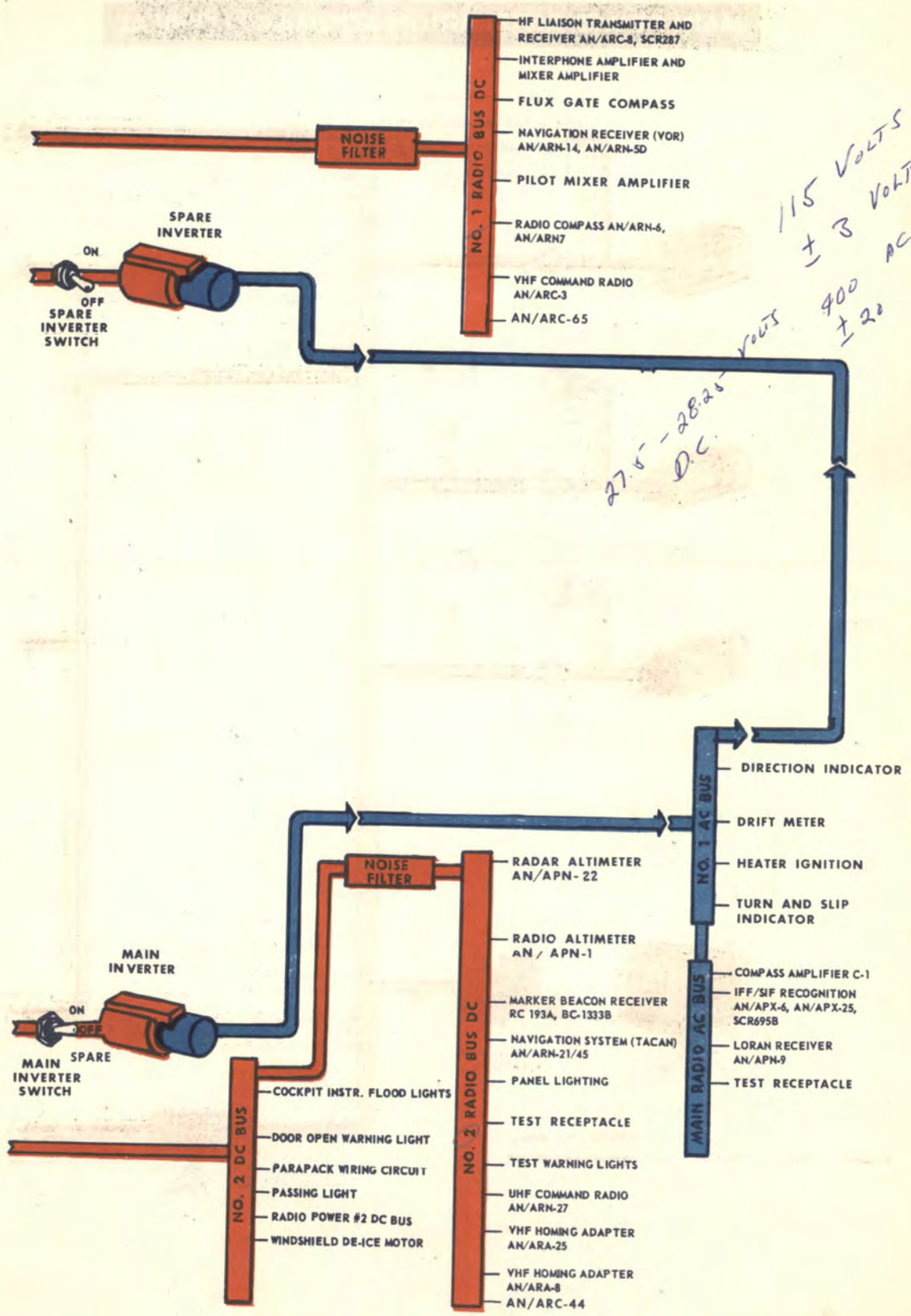


Figure 1-18 (Sheet 2 of 2)

MAIN POWER DISTRIBUTION SCHEMATIC - TYPICAL

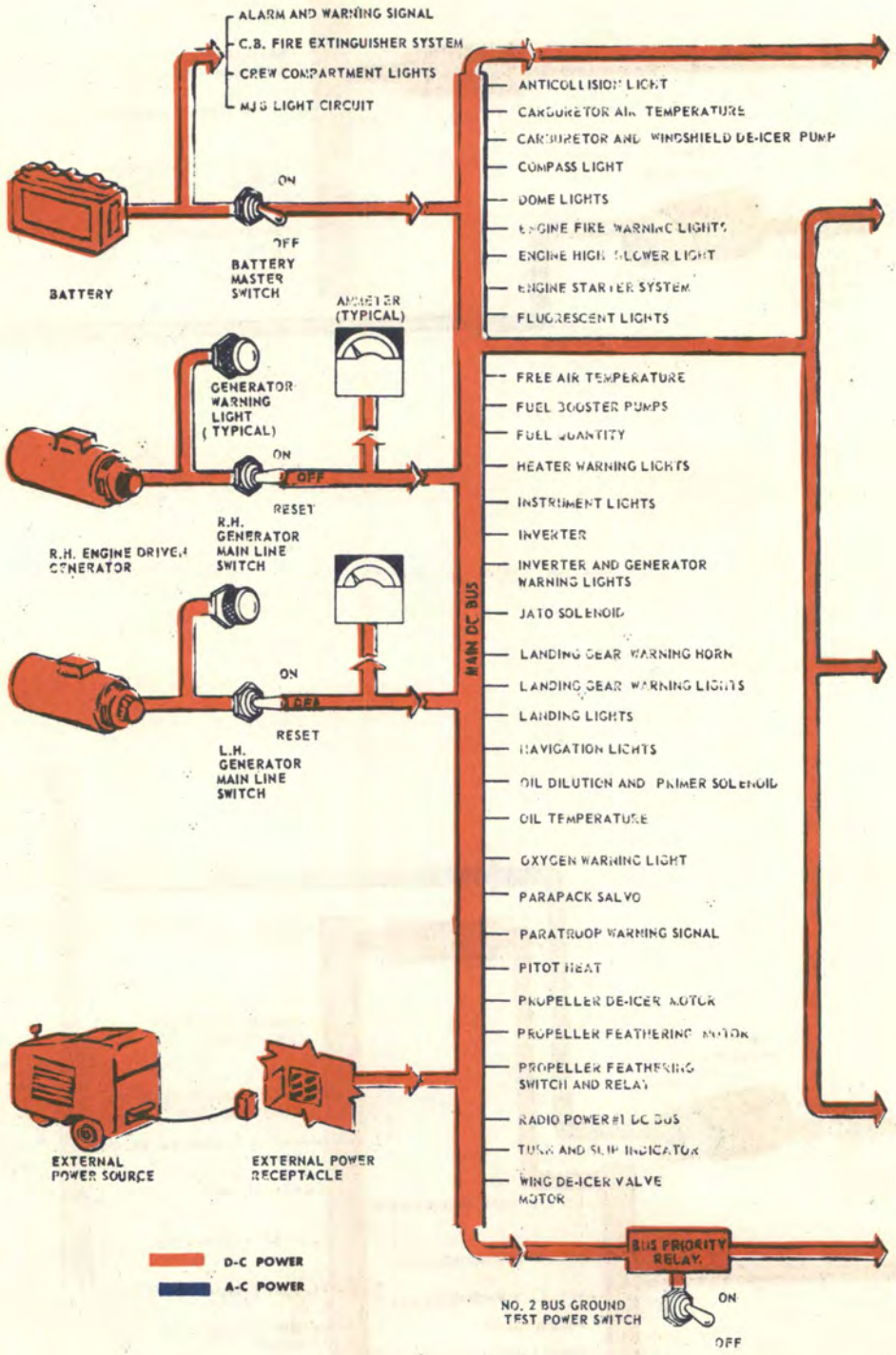


Figure 1-19 (Sheet 1 of 2)

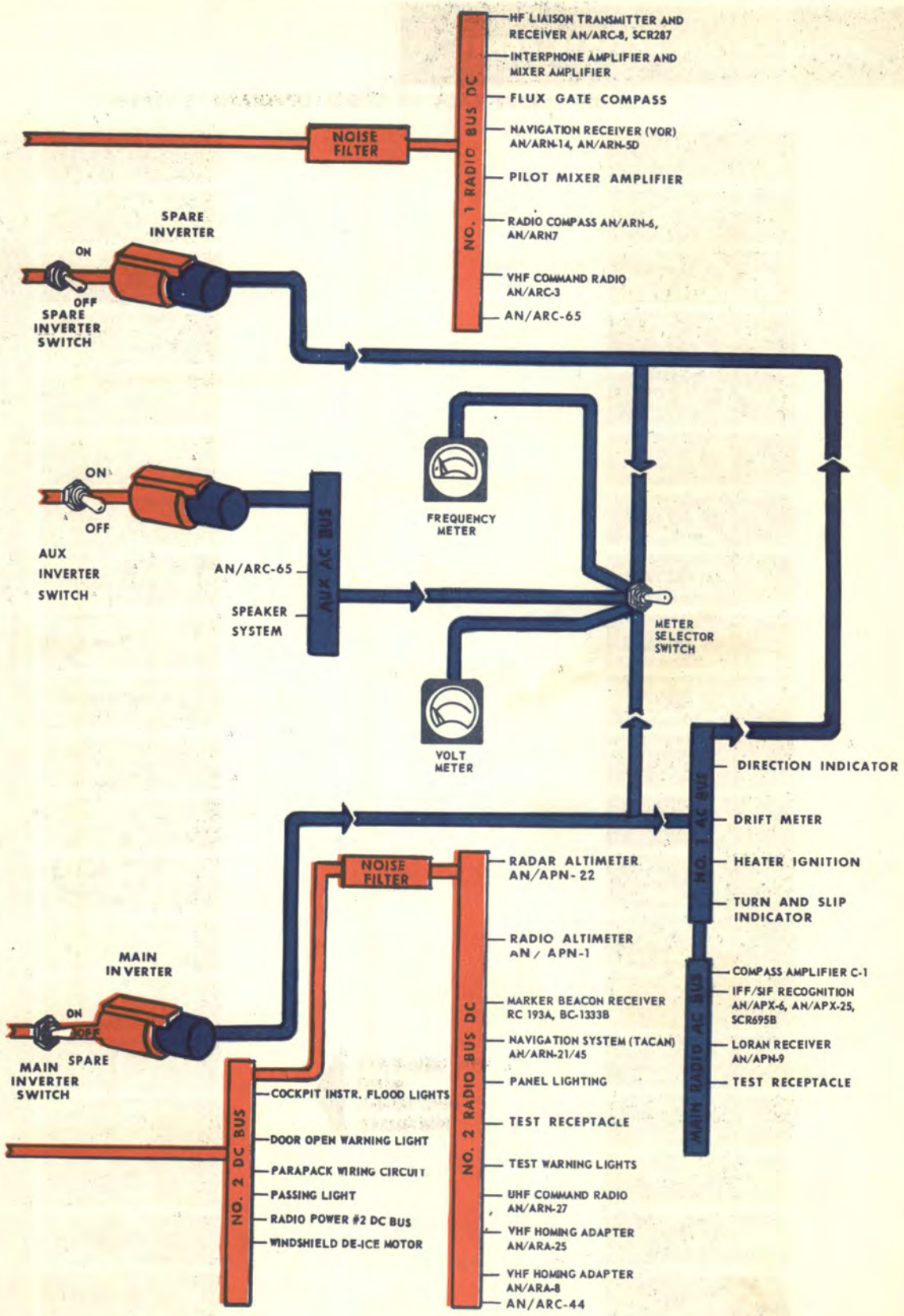


Figure 1-19 (Sheet 2 of 2)

RADIO CIRCUIT BREAKER PANEL

LOCATED: RADIO RACK AT RADIO OPERATOR'S STATION

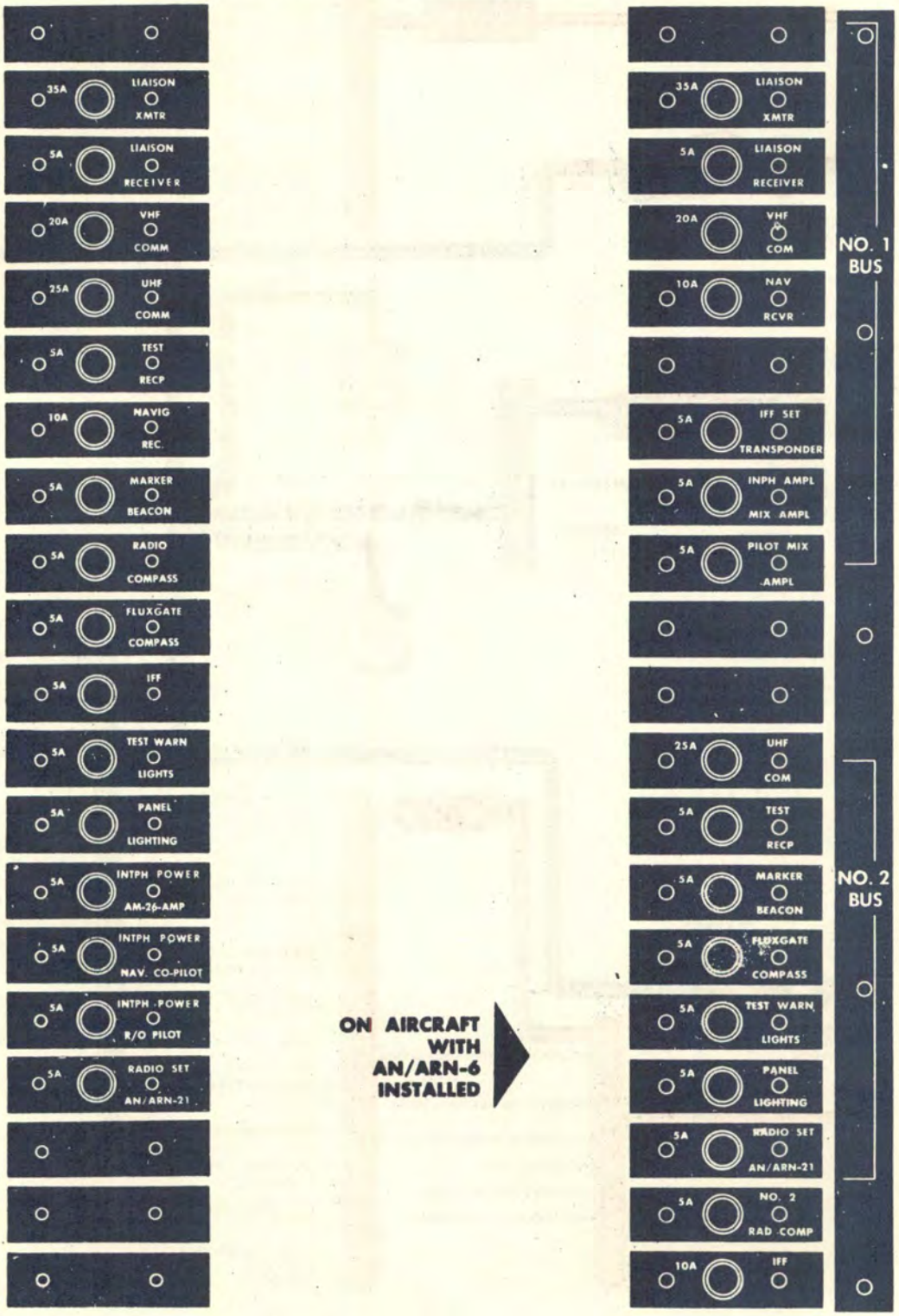


Figure 1-20

HYDRAULIC POWER SUPPLY SYSTEM.

NOTE

Hydraulic system on most company aircraft has been modified to provide higher pressure. Pressure operating range is between 800 and 1000 PSI with a pressure relief valve setting of 1100 (± 50) PSI. On these aircraft the accumulator air precharge is 300 (± 20) PSI with a minimum allowable air precharge of 250 PSI.

A pressure accumulator hydraulic power supply system (figure 1-23) operates the landing gear, wing flaps, brakes, cowl flaps, nonram carburetor air filter mechanism, and the windshield wipers, skis, and blower clutches.

Hydraulic fluid is supplied by gravity from the hydraulic fluid reservoir to the engine-driven hydraulic pumps (one on each engine), which supply fluid pressure for the hydraulic system and the autopilot system. The hydraulic pressure accumulator is attached to a bracket adjacent to the hydraulic fluid reservoir and aft of the bulkhead behind the co-pilot's seat. The lower chamber of the pressure accumulator is charged with air through the air valve fitting to an initial pressure of 250 psi. A system pressure relief valve, installed in the hydraulic system fluid pressure line, functions to protect the hydraulic system from excessive fluid pressure when the system pressure increases to 1000 (± 50) psi. A hydraulic hand pump is incorporated in the system for use when the engine-driven pumps fail to supply sufficient pressure or for ground operation of the hydraulic system when the engines are not running. A pressure regulator is installed in the main system pressure line to regulate system pressure between 600 and 875 psi. When system pressure is below 600 psi, the accumulator is charged until system pressure reaches this value. If system pressure exceeds 875 psi, fluid is ported to return until the pressure drops below 875 psi. The fluid capacity of the hydraulic reservoir is 10 quarts. Seven quarts are available to the engine-driven hydraulic pumps, while the remaining 3 quarts in the reservoir sump are available only to the hydraulic hand pump for emergency operation. The 3 quarts of fluid reserved for the hydraulic hand pump are not visible in the sight gage. For fluid specification and reservoir location, see Fig. 1-30.

HYDRAULIC HAND PUMP.

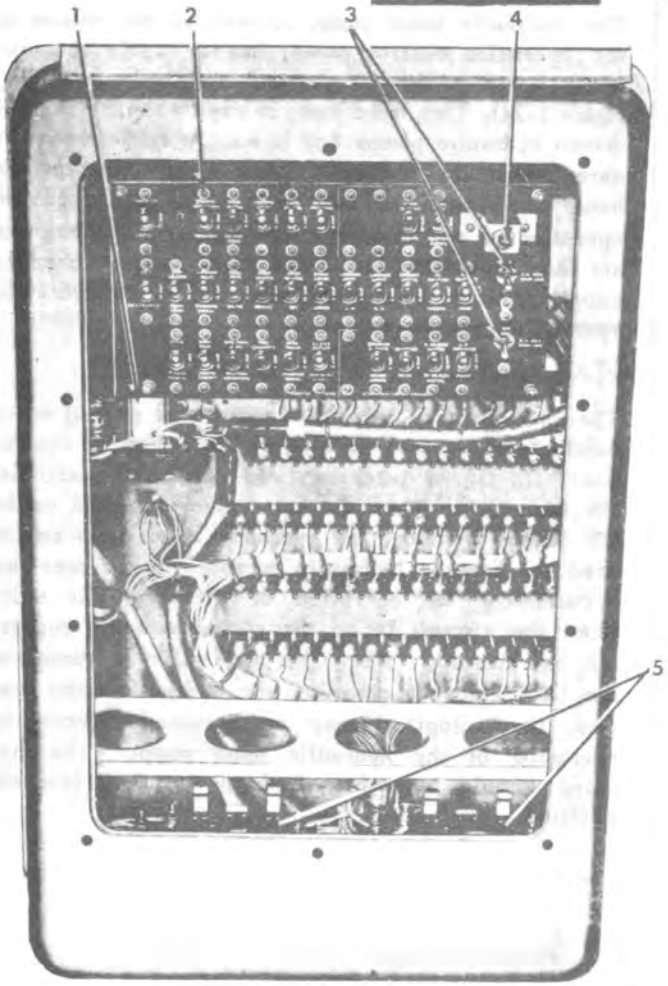
The hydraulic hand pump, located at the bottom of the hydraulic control panel, has a handle that extends between the pilot's and co-pilot's seats (9, figure 1-24). This hand pump is used when the engine-driven hydraulic pumps fail to supply sufficient pressure, when the hydraulic fluid supply (except the hand pump reserve) has been lost, or for ground operation of the hydraulic system when the engines are not running. The hand pump may be used to supply pressure to any unit operated by the hydraulic system, except the autopilot.

STAR VALVE.

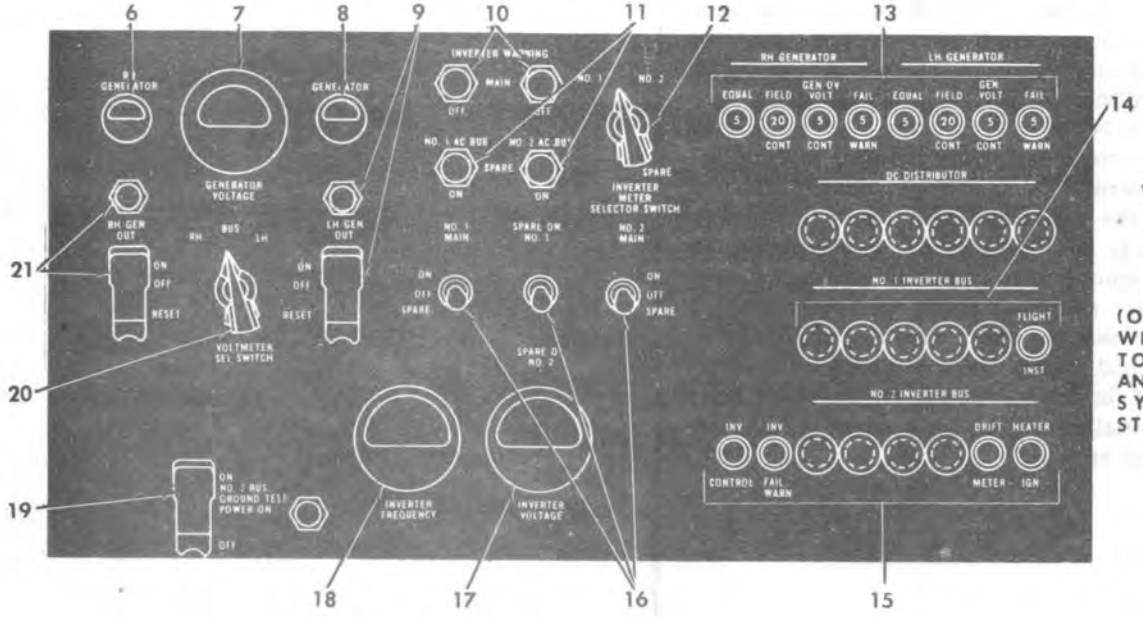
The hand pump to pressure accumulator shutoff valve handle, (star valve), located on the hydraulic control panel (6, figure 1-24) has two placarded positions, ON and OFF. When the star valve is turned to the ON (open) position, the hydraulic hand pump can be used to increase hydraulic pressure in the pressure accumulator for operation of the hydraulic units when the aircraft is on the ground and the engines are not running. When the star valve is turned to the OFF (closed) position, the hydraulic units (except the autopilot) may be actuated directly by operation of the hydraulic hand pump. The star valve should be safetywired to the OFF (closed) position.

MAIN ELECTRICAL JUNCTION BOX

GOVERNMENT FURNISHED AIRCRAFT



1. BATTERY CONNECTOR RELAY
2. CIRCUIT BREAKER PANEL
3. GENERATOR MAIN LINE SWITCHES
4. JUNCTION BOX LAMP SWITCH
5. VOLTAGE REGULATOR MOUNTS
6. RH GENERATOR LOADMETER
7. VOLTMETER
8. LH GENERATOR LOADMETER
9. LH GENERATOR SWITCH AND LIGHT
10. MAIN INVERTER WARNING LIGHTS
11. SPARE INVERTER WARNING LIGHTS
12. INVERTER METER SELECTOR SWITCH
13. GENERATOR CIRCUIT BREAKERS
14. NO. 1 INVERTER BUS CIRCUIT BREAKERS
15. NO. 2 INVERTER BUS CIRCUIT BREAKERS
16. INVERTER SWITCHES
17. INVERTER VOLTAGE METER
18. INVERTER FREQUENCY METER
19. GROUND TEST POWER SWITCH
20. VOLTMETER SELECTOR SWITCH
21. RH GENERATOR SWITCH AND LIGHT



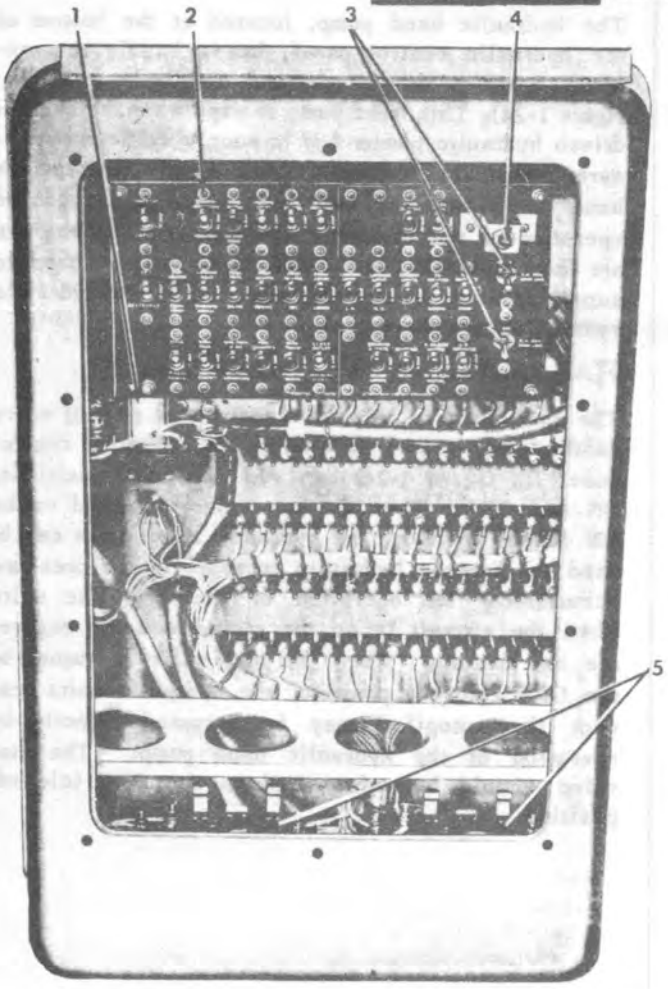
JUNCTION BOX CONTROL PANEL

(ON AIRCRAFT WITH GENERATOR-INVERTER AND BUS PRIORITY SYSTEMS INSTALLED)

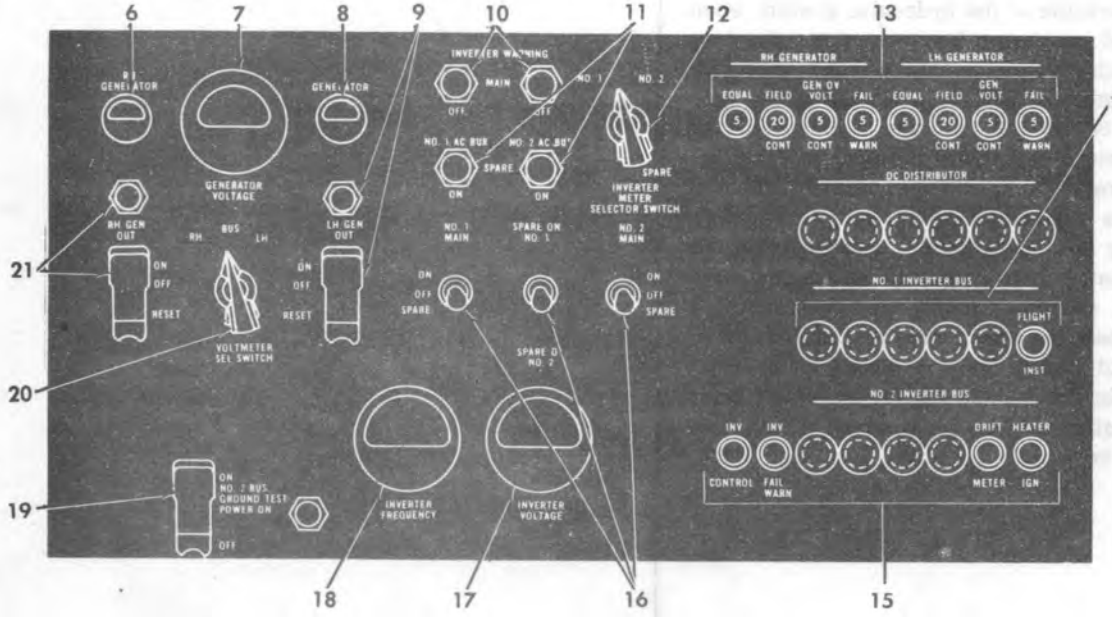
Figure 1-21

MAIN ELECTRICAL JUNCTION BOX

GOVERNMENT FURNISHED AIRCRAFT



1. BATTERY CONNECTOR RELAY
2. CIRCUIT BREAKER PANEL
3. GENERATOR MAIN LINE SWITCHES
4. JUNCTION BOX LAMP SWITCH
5. VOLTAGE REGULATOR MOUNTS
6. RH GENERATOR LOADMETER
7. VOLTMETER
8. LH GENERATOR LOADMETER
9. LH GENERATOR SWITCH AND LIGHT
10. MAIN INVERTER WARNING LIGHTS
11. SPARE INVERTER WARNING LIGHTS
12. INVERTER METER SELECTOR SWITCH
13. GENERATOR CIRCUIT BREAKERS
14. NO. 1 INVERTER BUS CIRCUIT BREAKERS
15. NO. 2 INVERTER BUS CIRCUIT BREAKERS
16. INVERTER SWITCHES
17. INVERTER VOLTAGE METER
18. INVERTER FREQUENCY METER
19. GROUND TEST POWER SWITCH
20. VOLTMETER SELECTOR SWITCH
21. RH GENERATOR SWITCH AND LIGHT



JUNCTION BOX CONTROL PANEL

(ON AIRCRAFT WITH GENERATOR-INVERTER AND BUS PRIORITY SYSTEMS INSTALLED)

Figure 1-21

Hydraulic Fluid Quantity Sight Gage.

A hydraulic fluid quantity sight gage is located at the top of the hydraulic control panel (2, figure 1-24) to indicate fluid quantity. A placard for servicing instructions is mounted adjacent to the sight gage.

Hydraulic System Pressure Gages.

Two hydraulic system pressure gages mounted in a bracket assembly below the right windshield at the co-pilot's station (16, 17, figure 1-7), are direct-reading, pressure operated gages calibrated from 0 to 2000 psi. One gage indicates the fluid pressure in the hydraulic system and the other indicates the fluid pressure in the landing gear DOWN line when the landing gear control lever is in the DOWN or NEUTRAL position.

On aircraft B-879 the hydraulic gages are small diameter gages on the co-pilot's instrument panel adjacent to the auto-pilot oil pressure gage. Also there are individual pump indicating pressure gages on the hydraulic control panel.

FIREWALL SHUTOFF VALVES.

See paragraph on the Firewall Shutoff Valve Handles, this section.

FLIGHT CONTROL SYSTEM.

The flight control system consists of independent elevator, aileron, and rudder systems. All flight controls are directly controlled and are operated by dual wheel and rudder pedals. The elevator, aileron, and rudder systems incorporate trim tabs.

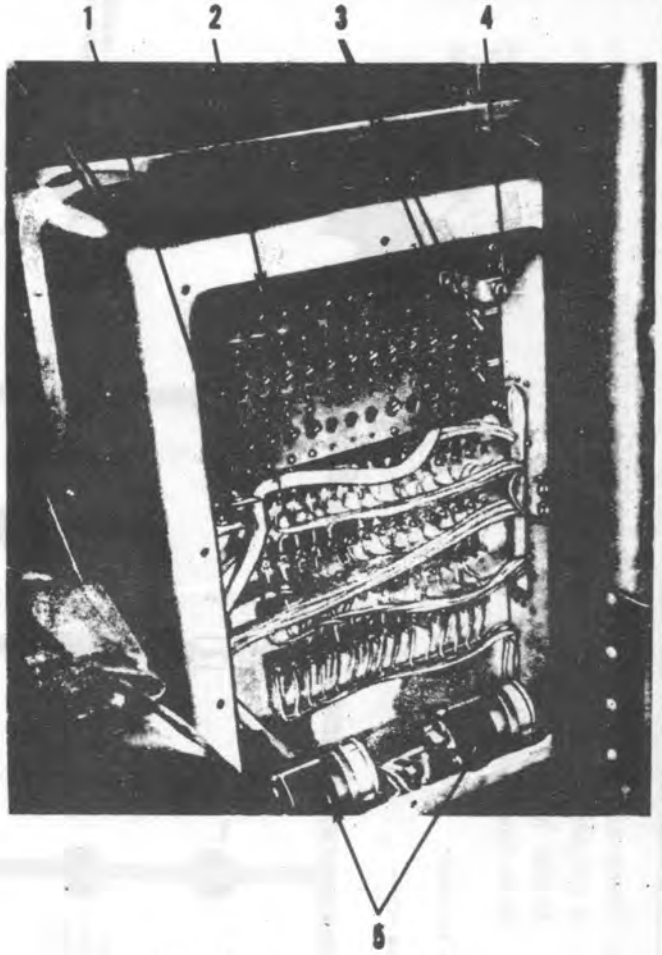
RUDDER PEDALS.

The rudder is mechanically controlled by a duplicate set of hinged rudder pedals incorporating toe brakes. The pedals can be adjusted forward or aft for proper length by means of the adjusting lever mounted on each rudder pedal.

Rudder Trim Crank.

Rudder trim is mechanically controlled by a rotatable crank mounted on the aft face of the control pedestal (11, figure 1-10). Movement of the trim tab is shown on the indicator immediately below the crank.

MAIN ELECTRICAL JUNCTION BOX
C-117 SERIES AIRCRAFT



1. BATTERY CONNECTOR RELAY
2. CIRCUIT BREAKER PANEL
3. GENERATOR MAIN LINE SWITCHES
4. JUNCTION BOX LAMP SWITCH
5. VOLTAGE REGULATORS

Figure 1-22

HYDRAULIC SYSTEM

Note: Some aircraft carry spare hydraulic fluid in a relocated windshield alcohol tank adjacent to the hydraulic reservoir. It is connected by a line and petcock.

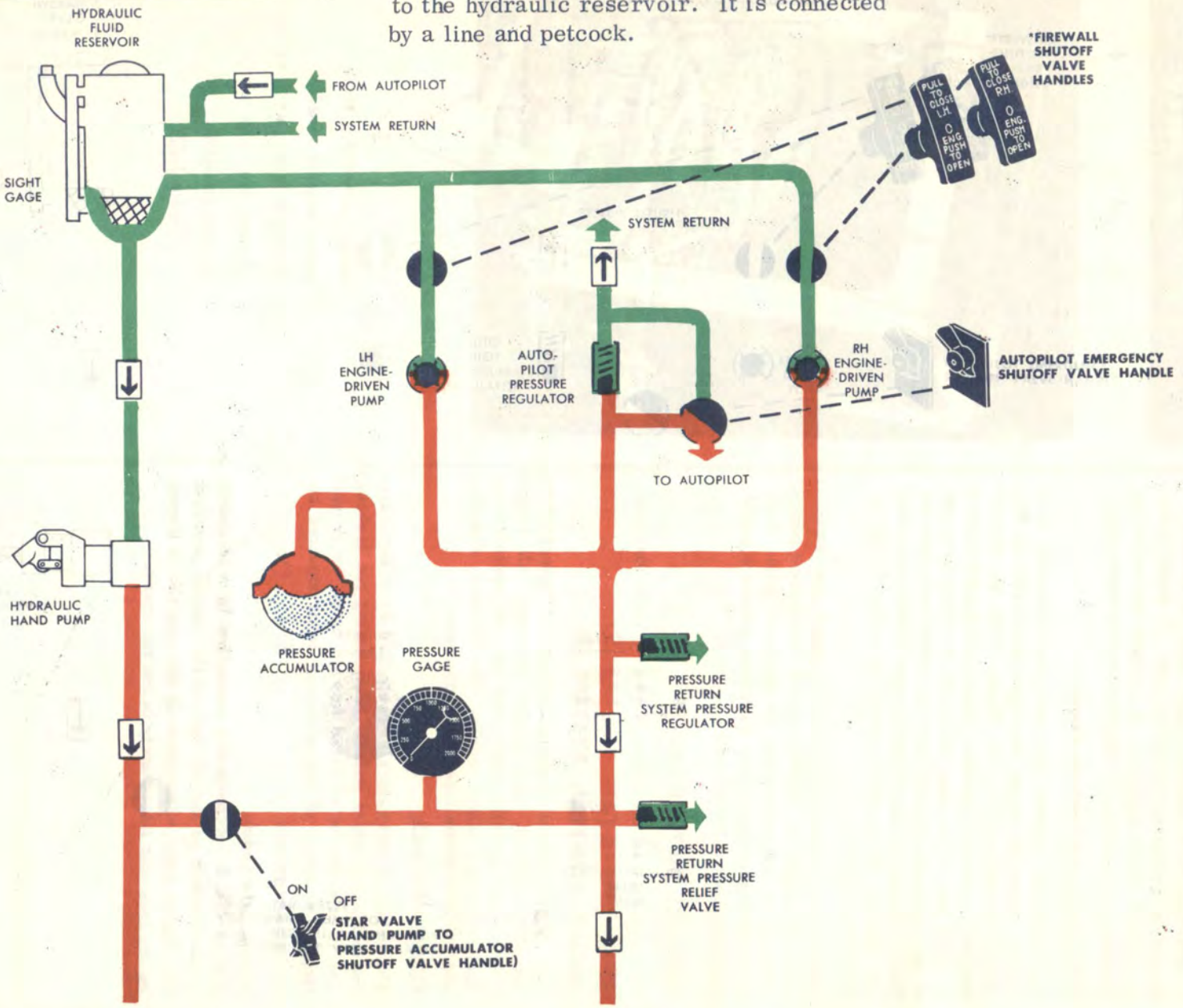


Figure 1-23 (Sheet 1 of 2)

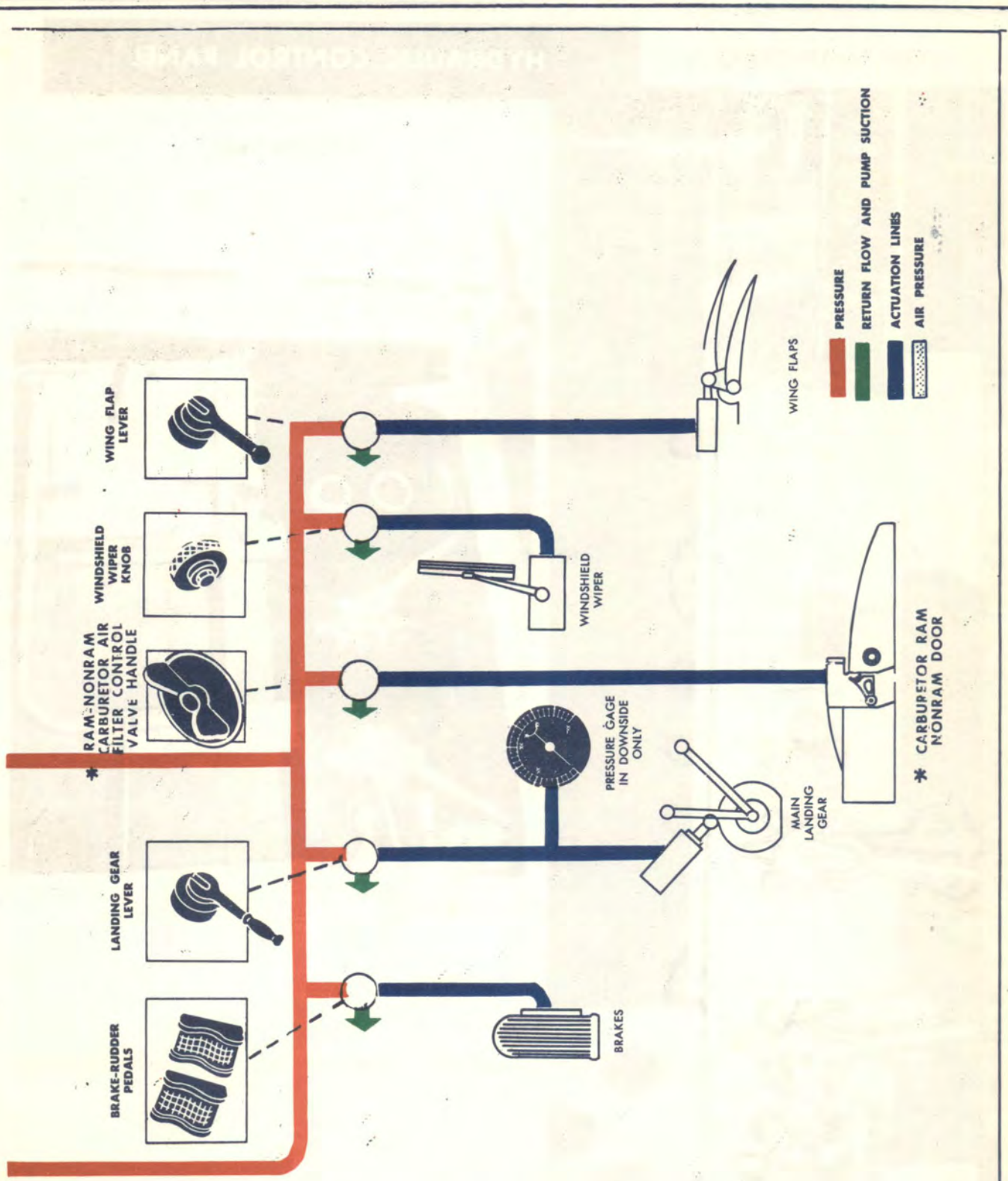
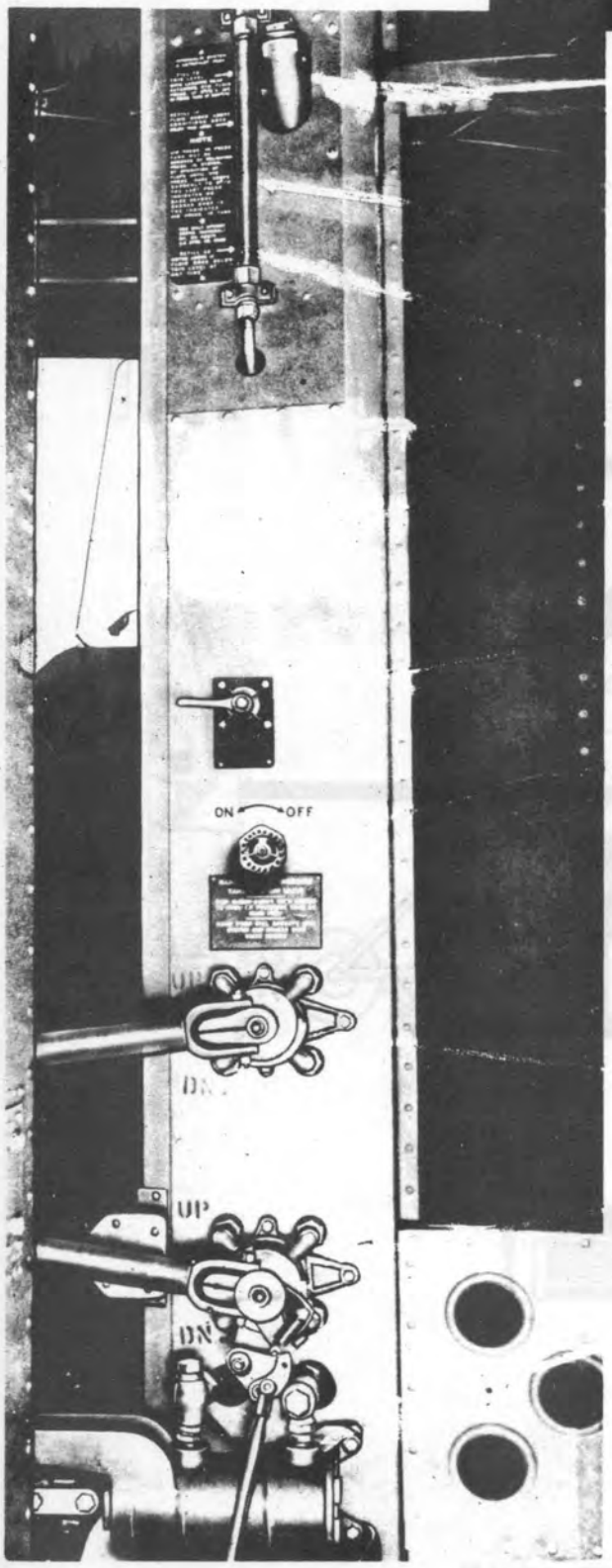


Figure 1-23 (Sheet 2 of 2)

TYPICAL AIRCRAFT

HYDRAULIC CONTROL PANEL

A/C 879 Only



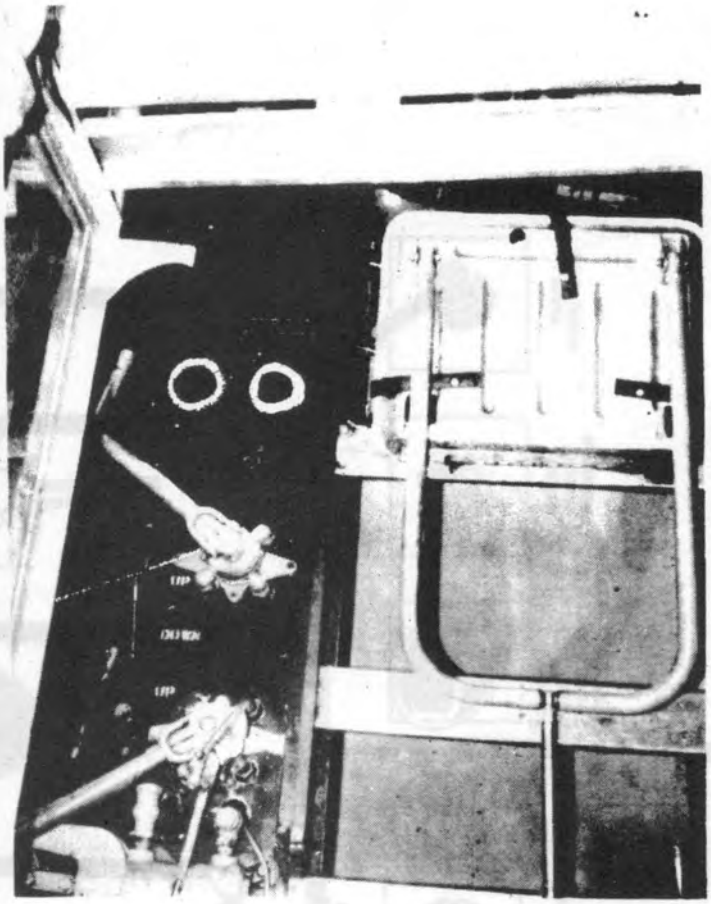


Figure 1-24

CONTROL COLUMNS.

Dual control columns, mounted forward of the pilot's and co-pilot's seats, provide mechanical control of the ailerons and elevators. The columns incorporate a wheel for aileron control, while elevator control is gained by forward and aft movement of the column.

Aileron Trim Crank.

Right aileron trim is mechanically controlled by a rotatable crank mounted on the aft face of the control pedestal (8, figure 1-10). Movement of the trim tab is shown on the indicator immediately below the crank.

Elevator Trim Wheel.

Elevator trim is mechanically controlled by a handwheel located on the pilot's side of the control pedestal (14, figure 1-10). Movement of the trim tabs is shown on an indicator adjacent to the handwheel.

CONTROL-SURFACE LOCKS.

The rudder, both ailerons, and both elevators are locked while on the ground by use of 5 control surface locks. The locks are felt-padded and equipped with small bungees which hold them firmly in place when slipped into position between the control surface and fixed surface. When not in use, the locks are stowed in the lavatory compartment (10, fig. 1-1.) On company aircraft the locks are stowed in a compartment in the left wing root fillet.

Figure 1-25

WING FLAPS.

The metal wing flaps are composed of four sections which extend from the inboard end of the left wing aileron under the fuselage to the inboard end of the right wing aileron and are of the split trailing-edge type. The flaps are hinged to the under side of the center wing section, and are hydraulically lowered or raised as a unit. The flaps have a travel of 0 to 45 degrees. Wing flap movement is hydraulically controlled by a lever located in the cockpit. Movement of the flaps is indicated by the wing flap position indicator located in the cockpit.

WING FLAP CONTROL LEVER.

The wing flap control lever, located on the hydraulic control panel (7, figure 1-24), has UP, DOWN, and NEUTRAL positions. Movement of the control lever to the DOWN position directs hydraulic fluid pressure to the wing flap actuating cylinder downline to lower the flaps. When the control lever is placed in the UP position, the flow of fluid is reversed to raise the flaps. When the flaps are positioned UP or DOWN as required, the control lever should be returned to the NEUTRAL (halfway) position to trap the fluid in the actuating cylinders and hold the desired flap setting.

Wing Flap Position Indicator.

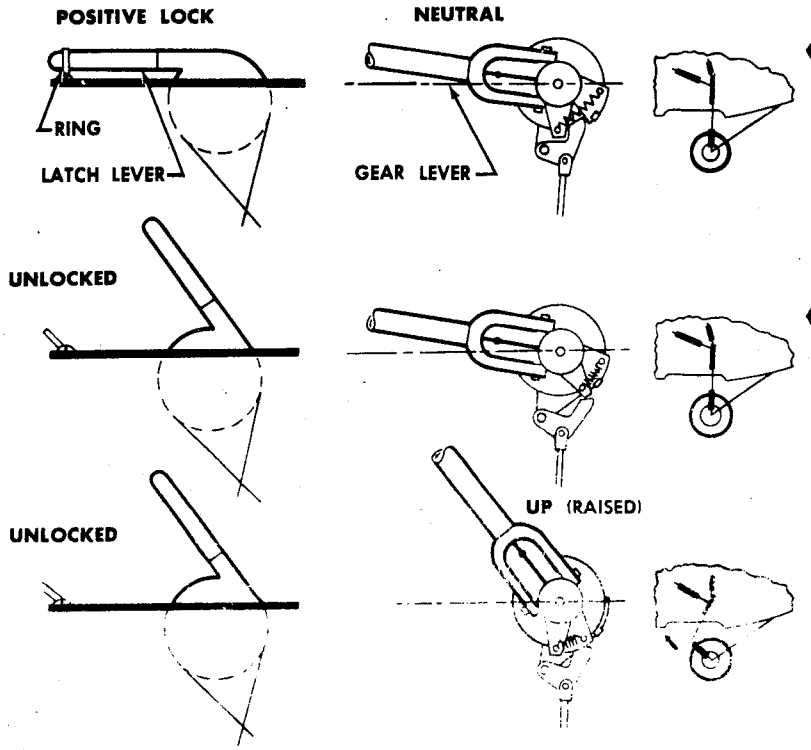
A mechanically actuated wing flap position indicator is mounted either vertically, at the left of the pilot's main instrument panel, or horizontally, on the bottom of the pilot's main instrument panel (5, figure 1-6 and 41, figure 1-12). Any movement of the wing flap actuating cylinder is shown by an equivalent movement of the pointer on the indicator by means of a flexible steel wire, sheathed in a tube and connected to the actuating cylinder at one end and to the indicator needle at the other end. The placarded positions indicated are UP –¼ –½ –¾ –DOWN.

LANDING GEAR SYSTEM.

NOTE

If hydraulic pressure is noted on the landing gear pressure gauge after takeoff or during flight, the landing gear handle should be recycled from the neutral position to the up position and back to neutral. The handle should be moved to each position in a rapid manner.

LANDING GEAR LATCH LEVER OPERATION

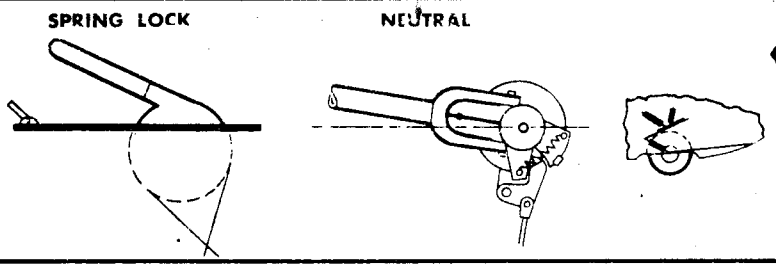


BEFORE TAKE-OFF:

1. LANDING GEAR LEVER—NEUTRAL
2. LATCH LEVER—POSITIVE LOCK

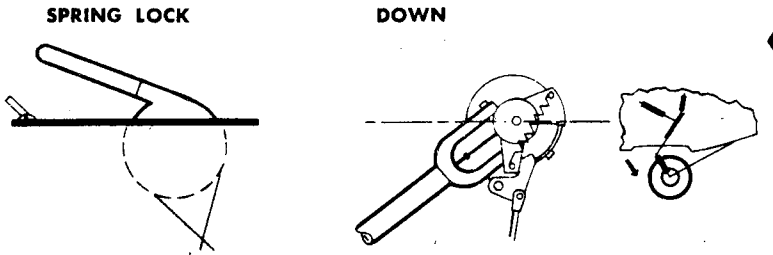
AFTER TAKE-OFF:

1. LATCH LEVER—RAISED
2. LANDING GEAR LEVER—UP



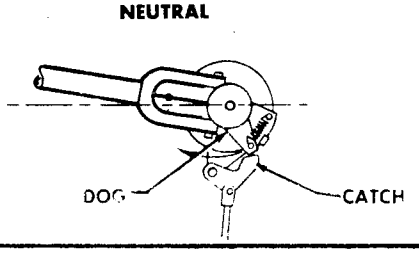
DURING FLIGHT:

1. LANDING GEAR LEVER—NEUTRAL
2. LATCH LEVER—SNAPS AUTOMATICALLY TO SPRING-LOCK POSITION



LANDING:

1. LANDING GEAR LEVER - DOWN
2. PRESSURE - UP
3. LEVER - NEUTRAL
4. GEAR WARNING LIGHT - GREEN
5. LATCH - POSITIVE LOCK



SHOULD LATCH LEVER BECOME JAMMED IN UNLOCKED POSITION BY OUT-OF-SEQUENCE OPERATION, PULL DOG FORWARD TO ALLOW CATCH TO SPRING INTO PLACE. LATCH LEVER WILL THEN RETURN TO SPRING-LOCK POSITION.

Figure 1-26

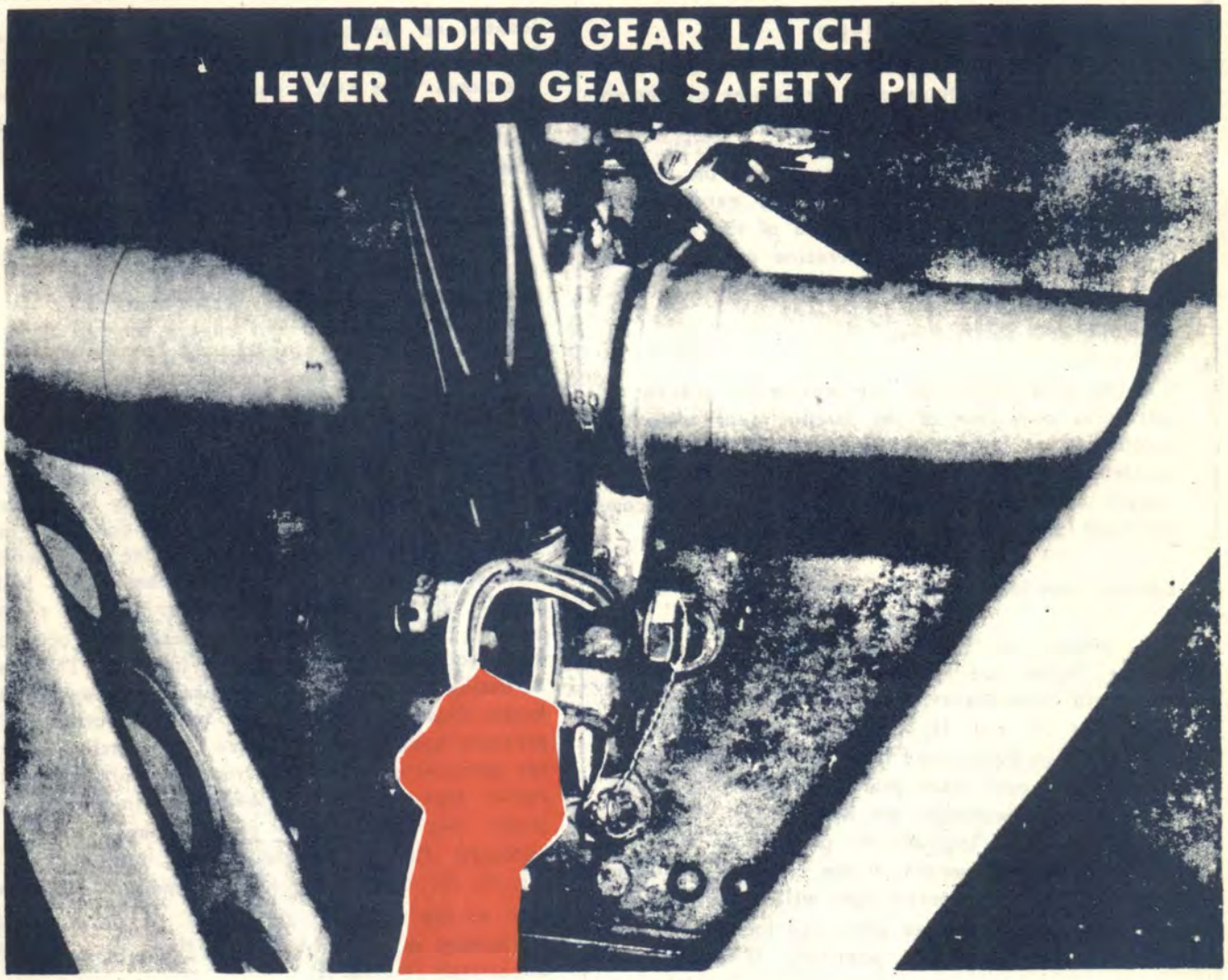


Figure 1-27

The landing gear consists of main landing gear and a tail gear. The hydraulically operated main gear is extended or retracted by two hydraulic actuating cylinders (figure 1-23), one located in each nacelle, and controlled by a lever located on the hydraulic control panel in the cockpit. A mechanical safety latch is provided to prevent inadvertent raising of the main landing gear. In the event of a landing gear hydraulic line failure, the gear will free fall when the landing gear control lever is moved to the DOWN position. The tail wheel is not retractable, but is full swiveling and can be locked in the trail position.

LANDING GEAR LEVER.

The landing gear lever, located on the hydraulic control panel (8, figure 1-24), has DOWN, NEUTRAL, and UP positions. Movement of the lever to the DOWN position directs hydraulic fluid pressure to the landing gear downline to extend the main gear. When the lever is placed in the UP position, the flow of fluid is reversed to the upline to retract the main gear. When the lever is in the NEUTRAL position, fluid flow is blocked to both the upline and the downline. The main landing gear is held in the UP position by trapped hydraulic fluid with the lever in the NEUTRAL position. When the main gear is extended or retracted as required, the lever should be returned to the NEUTRAL (halfway) position to hold the desired setting.

NOTE

The landing gear latch must be released (LATCH RAISED position) before the main gear can be retracted because a catch and dog prevent the landing gear lever from being moved into the UP position.

LANDING GEAR LATCH LEVER.

The landing gear safety latches for both main gear are controlled simultaneously by cables connected to the landing gear latch lever, located on the floor to the right of the pilot's seat (figure 1-25). The safety latch automatically latches to lock the landing gear when the landing gear is fully extended, by engaging a slot in the lower end of the actuating cylinder piston rod. For operation of the landing gear safety latch lever, see figure 1-26.

Landing Gear Safety Pins.

Landing gear safety pins are provided to prevent inadvertent retraction of the landing gear when the aircraft is on the ground (figure 1-27). When not installed, the safety pins are stowed in the canvas pocket on the aft bulkhead of the main cabin compartment (8, figure 1-1).

Landing Gear Indicator Lights.

The 28-volt d-c landing gear red and green indicator lights are located on the right side of the main instrument panel (18 and 20, figure 1-11, and 20 and 21, figure 1-12). 28-volt d-c microswitches are mounted next to the landing gear lever and on each main gear. These switches are actuated by movement of the landing gear lever and the main gear to indicate the position of the main gear and lever by means of the red and green indicator lights. The green light will be illuminated when both main gears are down and locked and the lever is in the NEUTRAL position. If the landing gear is retracted, or in any intermediate position or down and unlatched, or the landing gear is down and latched with the lever not in NEUTRAL position, the red indicator light will be illuminated. The red indicator light will go out when the landing gear is down and locked and the lever is in the NEUTRAL position. On some aircraft, the red indicator light will go out when the gear is fully retracted.

Landing Gear Warning Horn.

The 28-volt d-c landing gear warning horn, located in the fuselage to the left of the pilot's seat, will sound when one or both throttles are less than approximately ¼ open and the landing gear is not down and locked with the lever in the NEUTRAL position, or when the landing gear lever is not in the NEUTRAL position. No switch is provided for silencing the horn.

Tail Wheel Lock Lever.

The mechanically operated tail wheel lock lever is located on the control pedestal below the throttle levers (12, figure 1-10), and has LOCK and UNLOCK positions. The LOCK position locks the tail wheel in the trailing position for take-offs and landings; the UNLOCK position allows free swiveling of the wheel for taxing.

NOTE

The tail wheel must be in the centered position before the tail wheel lock pin will engage the tail wheel in the LOCK position.

BRAKE SYSTEM.

The main landing gear wheel hydraulic brakes may be applied independently or simultaneously by means of two brake control valves, which are contained in a single housing and linked to the rudder brake pedals. Application of toe pressure on the rudder brake pedals allows hydraulic fluid under pressure to flow through the brake control valves and brake operating lines to the brake actuating cylinders. The brake actuating pistons force the brake shoes against the brake drums to produce the braking action. The pressure applied to the brakes is proportional to the toe pressure applied to the rudder pedals. When the rudder brake pedal is released, springs return the brake shoes to the off position, and the excess hydraulic fluid flows through the brake operating line to the brake control valve and into the return line to the hydraulic reservoir. A parking brake mechanism is provided to hold the brakes on when the aircraft is parked.

HYDRAULIC BRAKE CONTROLS.

The hydraulically operated brakes are controlled by toe pressure on the rudder brake pedals. Full braking action is possible even when the landing gear is retracted.

Parking Brake Control Knob.

The main wheel brakes may be locked on for parking by means of the mechanical parking brake control knob mounted on the lower portion of the control pedestal (7, figure 1-10). To set the parking brake, the pilot's rudder brake pedals should be fully depressed and the parking brake control knob pulled out. The rudder brake pedals should be released before the parking brake control knob is released. To release the parking brake, toe pressure should be applied on the rudder brake pedals. The brakes on both wheels should be locked and released simultaneously.

NOTE

The parking brakes are locked and released by use of the pilot's rudder brake pedals only.

INSTRUMENTS.

The dual manifold pressure gage is a direct-reading instrument. The free air temperature indicator is electrically operated. The vacuum-operated instruments include the attitude indicator, the directional indicator, and the turn-and-slip indicator. For proper operation of the vacuum instruments, engine rpm should be at least 1000.

VACUUM SYSTEM.

The vacuum system consists of two engine-driven vacuum pumps, two vacuum relief valves, two check valves, a vacuum manifold, two air filters, a vacuum restrictor for the turn-and-slip indicator, and the connecting lines. A direct-pressure-operated vacuum gage mounted on the main instrument panel (10, figures 1-11 and 13, figure 1-12) indicates the vacuum pressure in inches Hg. (See the paragraph on the Autopilot, Section IV.)

PITOT-STATIC SYSTEM.

The pitot-static system instruments and equipment consist of two airspeed indicators, two altimeters, and a vertical velocity indicator, all installed on the main instrument panel (figures 1-11 and 1-12); and two pitot-static tubes mounted on masts on the underside of the fuselage nose section (21, figure 1-1), a static selector, and the connecting lines. The static selector control switch mounted on the main instrument panel (21, figure 1-11, and 25, figure 1-12), provides for selection of an alternate static source (16, figure 1-1) in the event of malfunctioning of the normal static source. On some aircraft, the alternate static source is located in the left aft fuel tank bay. The selector switch is safetywired to the normal static source. The pitot-static tubes are protected from ice by integral heating elements.

ELECTRICALLY OPERATED INSTRUMENTS. (Some Aircraft).

The attitude indicator and the directional indicator are driven by AC power from the No. 1 AC bus located in the Main Electrical Junction Box. The turn and slip indicator is driven by DC power and has a separate switch directly to the battery.

FREE AIR TEMPERATURE INDICATOR.

One 28-volt d-c free air temperature indicator is mounted on the main instrument panel (12, figure 1-11, and 17, figure 1-12). The indicator is connected to the thermometer resistance bulb on the underside of the nose section so that changes in the temperature of the outside air will be registered on the indicator face by means of changes in the electrical current between the bulb and the indicator. The indicator is calibrated in degrees centigrade.

EMERGENCY EQUIPMENT.

FIRE EXTINGUISHING SYSTEM.

Most aircraft are equipped with a single-shot FREON (CF_3Br) engine fire extinguishing system. The system incorporates two spherical containers containing 6.5 pounds of FREON, one located in each engine nacelle (24, Fig 1-1), the necessary piping for routing the agent to the spray ring mounted on each engine, and the controls for operation of the system. Each container is pressurized with nitrogen to 600 psi standard day and incorporates a pressure gage for checking pressure within the container. A fire detection circuit is also provided for each engine.

NOTE

The fire extinguishing system is connected directly to the batteries and will operate regardless of battery switch position. They are also protected by circuit breakers located on the main junction box.

Two portable hand fire extinguishers, one mounted on the bulkhead above the pilot's seat, and one mounted on the rear section of the main cabin door or, on C-117 series aircraft, immediately forward of the passenger entrance door, are provided for combating fires in the fuselage.

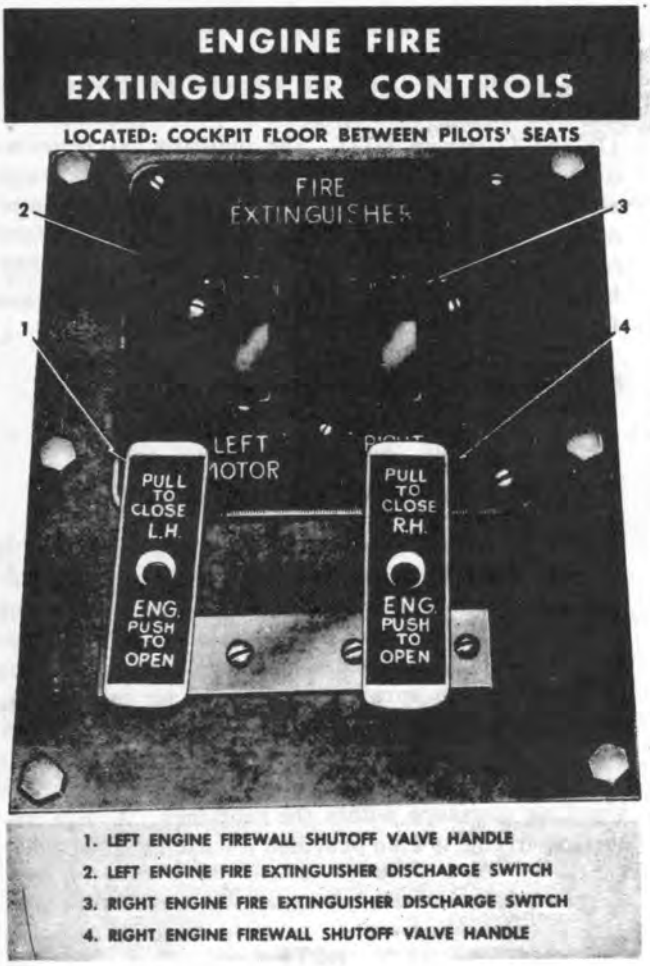


Figure 1-28

Engine Fire Extinguisher Switches.

Two guarded ON-OFF fire extinguisher switches (2 and 3, figure 1-28), one for the left engine and one for the right engine, are located under the hinged door on the flight compartment floor between the pilot's and co-pilot's seats. When either switch is placed in the ON position, a 28-volt d-c circuit is energized to discharge the CB agent to the respective spray ring around the engine.

CB Container Pressure Gages.

A pressure gage mounted on each CF_3Br container indicates the charge in psi within the container. When the container is fully charged the indicator should read 600 psi standard day.

FIREWALL SHUTOFF VALVE SWITCHES

Some company aircraft have been modified to incorporate electrical firewall shutoff valve switches which shuts off all fuel and hydraulic fluid to the engine. These switches are mounted forward of each fuel selector valve. Each switch is a 3-position switch labeled OPEN-NEUTRAL-CLOSED. The switches are protected by circuit breakers located on the main junction box case. On B-879 they are located on the main junction box circuit breaker panel.

FIREWALL SHUTOFF VALVE POSITION LIGHTS

A red press-to-test light, located on the instrument panel directly above each Fire-wall Shutoff Switch, is illuminated when the Shutoff Valve is closed.

Firewall Shutoff Valve Handles.

The firewall shutoff valve handles for shutting off the flow of fuel, engine oil, and hydraulic fluid are located under the engine fire extinguisher access door between the pilot's and co-pilot's seats (1 and 4, figure 1-28). The shutoff valves are connected by cables to the handles. In case of fire in either engine, the corresponding handle is pulled, shutting off the flow of fuel, engine oil, and hydraulic fluid to that engine.

NOTE

When a firewall shutoff valve handle or switch is activated, oil for propeller feathering is still available.

ENGINE FIRE DETECTION WARNING SYSTEM. (IF INSTALLED).

Two 28-volt d-c fire detection press-to-test warning lights, one for each nacelle, are located on the main instrument panel (9, figure 1-11). The system has a thermocouple circuit for detecting fire. When either engine fire detector circuit detects fire, the respective fire warning light for that circuit illuminates. A circuit breaker for the fire detection system is provided on the upper right side of the main junction box.

Fire Detector Test Switch.

A 28-volt d-c fire detector pushbutton test switch, located adjacent to the warning lights, provides a method of checking the fire detection warning circuits. When the test switch is held in, both warning lights should illuminate within 10 seonds. If the warning lights do not illuminate within 10 seconds the circuit is defective.

ALARM AND WARNING SYSTEM.

An emergency warning bell is mounted on the left side of the main cargo compartment forward bulkhead. The bell is operated by a 28-volt d-c switch mounted on the electrical control panel (24, figure 1-13 and 1, figure 1-14); on some aircraft it is wired directly to the aircraft batteries, and on other aircraft to the main junction box bus. See Section III for Emergency Alarm Bell Procedures.

FIRE EXTINGUISHER SYSTEM (TC-47K) AND SOME C-47 AIRCRAFT).

The aircraft is equipped with a one-shot, mechanically controlled CO_2 fire extinguisher system for the protection of each engine accessory section. Strategically located fire detectors actuate fire warning lights on the main instrument panel. A red celluloid indicator is mounted on the right side of the fuselage nose section skin, to indicate thermal discharge of CO_2.

FIRE EXTINGUISHER SELECTOR VALVE CONTROL (TC-47K).

A three-position fire extinguisher selector valve control is located under an access door in the floor between the pilot's and co-pilot's seat for selecting engine for CO_2 discharge.

DISCHARGE CONTROL HANDLE (TC-47K).

One CO_2 discharge control handle is located under an access door in the floor between the pilot's and co-pilot's seats.

LIFE RAFTS (C-47 AND R4D SERIES AIRCRAFT).

Provision is made for stowage of suitable life rafts on the right side of the main cabin compartment (5, figure 3-3).

EMERGENCY ESCAPE ROPE

An emergency escape rope is located in the cockpit directly above the Mail door.

CAUTION

The door is not to be opened with engine running

EMERGENCY TRANSMITTER.

The aircraft is equipped with an emergency radio transmitter which is strapped on the bulkhead next to the cargo door.

EMERGENCY EXITS (C-47 AND R4D SERIES AIRCRAFT).

The five emergency exits consist of the hatch above the pilot and co-pilot, the forward panel of the main cargo door; the fifth window aft on both sides of the main cargo compartment, and the small baggage door in the forward baggage compartment (figure 3-5).

EMERGENCY EXITS (C-117 SERIES AIRCRAFT).

The six emergency exits include the hatch above the pilot and co-pilot, the small baggage door in the forward baggage compartment, the fifth and sixth windows aft on the right side of the main cabin, the fifth window aft on the left side of the main cabin, and the main cabin entrance door (figure 3-5).

MISCELLANEOUS EMERGENCY EQUIPMENT.

The following miscellaneous emergency equipment is shown on figure 3-3.

Hand fire extinguishers.
First aid kits.
Fire axe.
Pyrotechnic pistol (C-47 and R4D series aircraft).
Parachute stowage (C-47 and R4D series aircraft).
Parachute flare release tubes (HC-47 and C-117 series aircraft).

ENTRANCE DOORS.

Entrance to the aircraft is normally made through the forward cargo (passenger) loading door, located on the aft left side of the fuselage. External and internal latch handles, located on the aft end of the forward door, are provided for latching or unlatching the door. A clip is provided to secure the door against the fuselage when fully opened. If entry through the cargo doors is not feasible, an extension ladder is provided for entrance through the small forward baggage loading door, located on the left side of the fuselage immediately aft of the pilot's station. A door open warning light is installed on the extreme right hand side of the instrument panel (figure 1-11 and 1-12) to indicate when either or both of the doors is not correctly locked. On some C-117 series aircraft, the Door Open Warning Light will also indicate when the aft baggage compartment door is not correctly locked.

PILOTS' SEATS.

The pilot's and co-pilot's seats (figure 1-32) provide forward, aft, and vertical adjustments. The inboard armrest of each seat can be pivoted to provide easy access to the seat.

PILOTS' SEAT FORWARD AND AFT ADJUSTMENT CONTROLS.

A short cable at the lower right of the pilot's seat and the lower left of the co-pilot's seat (3, figure 1-29) operates the horizontal release catch to adjust the seat forward or aft on two horizontal tracks. Adjustment is accomplished by shifting body weight as required.

PILOTS' SEAT VERTICAL ADJUSTMENT LEVERS.

A lever at the left of the pilot's seat and the right of the co-pilot's seat (2, figure 1-29) operates the vertical release catch to adjust the seat vertically on vertical tracks. The seat is raised by bungees when the vertical adjustment catch is released.

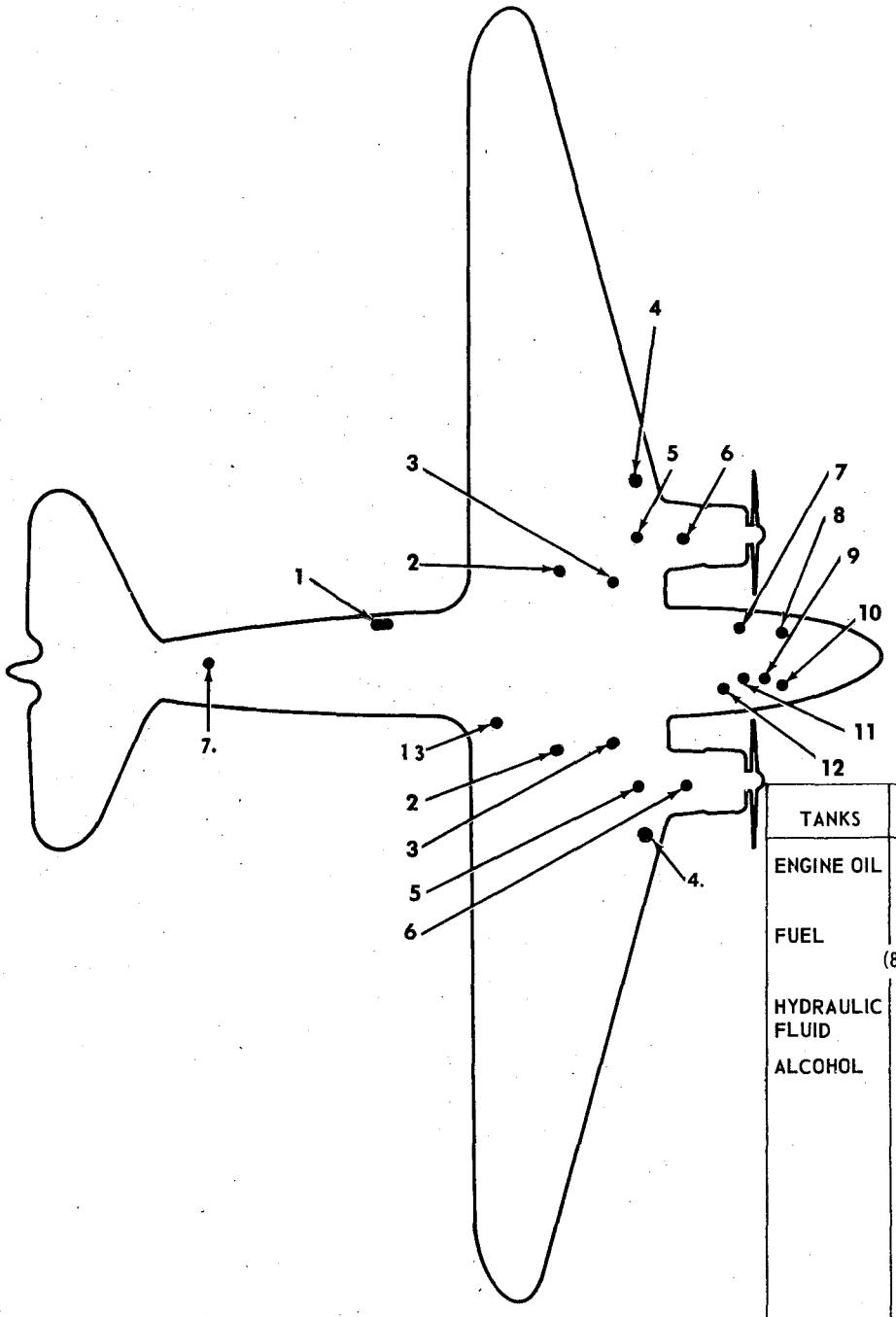
Adjustment is accomplished by increasing or decreasing body weight as required.

AUXILIARY EQUIPMENT.

The following auxiliary equipment is described in Section IV:

Heating and ventilating system
Anti-icing and de-icing systems (disconnected)
Oxygen Systems (Disconnected)
Communication equipment
Autopilot
Navigation equipment
Lighting system
Cargo tie-down provisions
Cargo loading equipment
Troop carrying equipment
Passenger carrying equipment
Miscellaneous equipment

SERVICING DIAGRAM



1. OXYGEN FILLER VALVE (SOME AIRCRAFT)
2. AUXILIARY FUEL TANK FILLER NECK
3. MAIN FUEL TANK FILLER NECK
#4. OUTER WING TANK FILLER NECK
5. OIL TANK FILLER NECK
6. OIL TANK DIPSTICK ACCESS PANEL
7. WATER SUPPLY TANK FILLER
8. PROPELLER DEICING TANK FILLER NECK
9. HYDRAULIC RESERVOIR FILLER NECK
10. INFLIGHT WINDSHIELD AND CARBURETOR DEICING TANK FILLER NECK (SOME AIRCRAFT)
† 11. WINDSHIELD DEICING TANK FILLER NECK
† 12. CARBURETOR DEICING TANK FILLER NECK
* 13. WINDSHIELD AND CARBURETOR DEICING TANK FILLER NECK

TANKS	NO. TANKS	USAF SPECIFICATION	GRADE	NATO SYMBOL
ENGINE OIL	2	MIL-L-6082 MIL-L-22851 (ALT)	1100 1100	O-117 ---
FUEL	4 (8, HC-47)	MIL-G-5572 (ALT) MIL-G-5572	115/145 100/130	F-22 F-18
HYDRAULIC FLUID	1	MIL-H-5606		H-515
ALCOHOL	4	PROPELLER DE-ICING TT-I-735 GRADE B OR MIL-F-5566 (ALT) --- CARBURETOR AND WINDSHIELD DE-ICING MIL-A-6091 TYPE 1 OR TT-I-735 GRADE B OR MIL-F-5566 (ALT)		S-737 S-738 S-737
OXYGEN	---	MIL-O-27210		
APP OIL	---	MIL-L-8383		
WATER	2			

* C-47 and C-117 series aircraft
† R4D series aircraft
#SC-47 series aircraft

Figure 1-30

EMERGENCY EQUIPMENT CHART

BAILED CARGO C-47

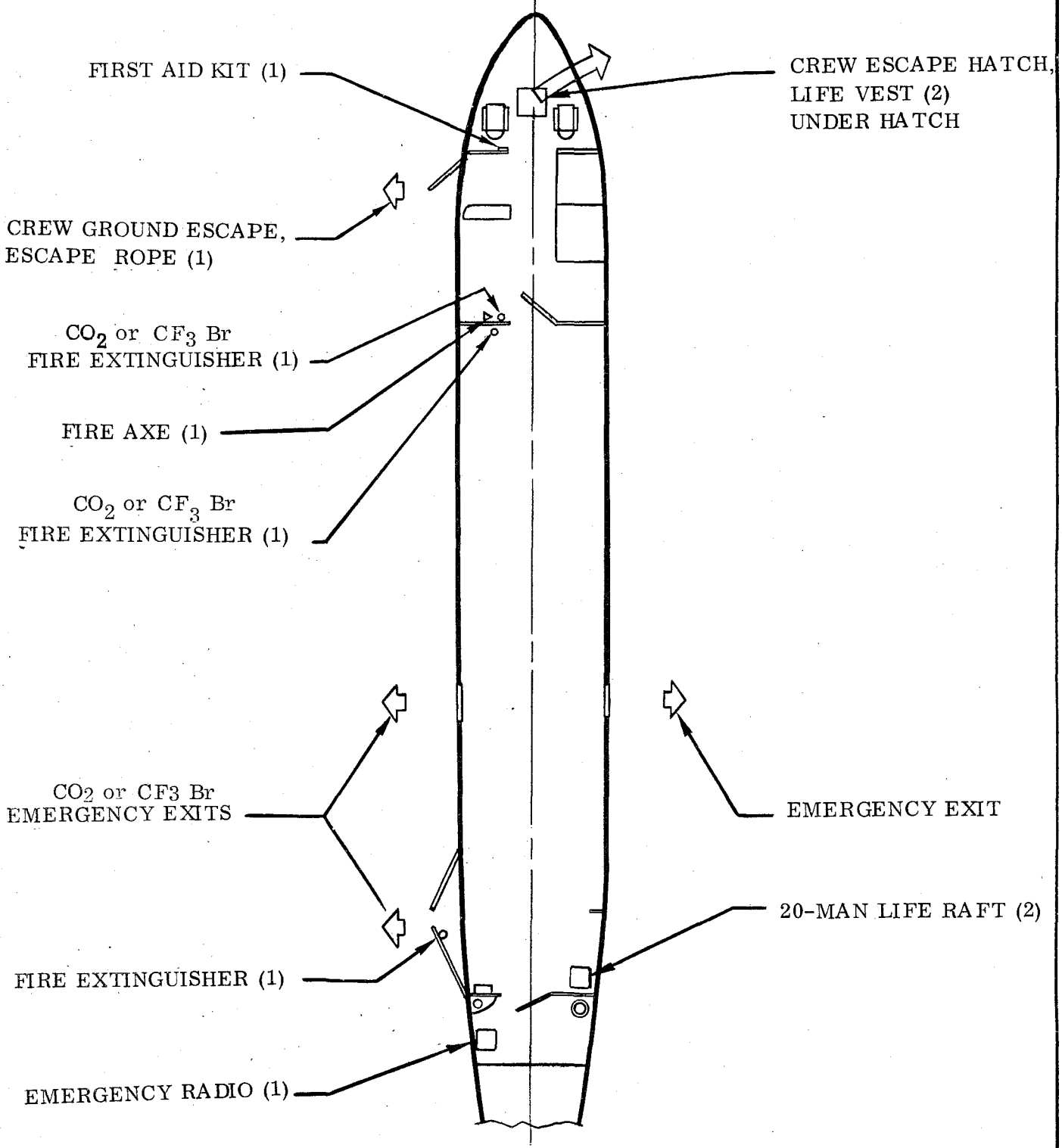


Figure 1 - 31

EMERGENCY EQUIPMENT CHART

COMPANY AIRCRAFT

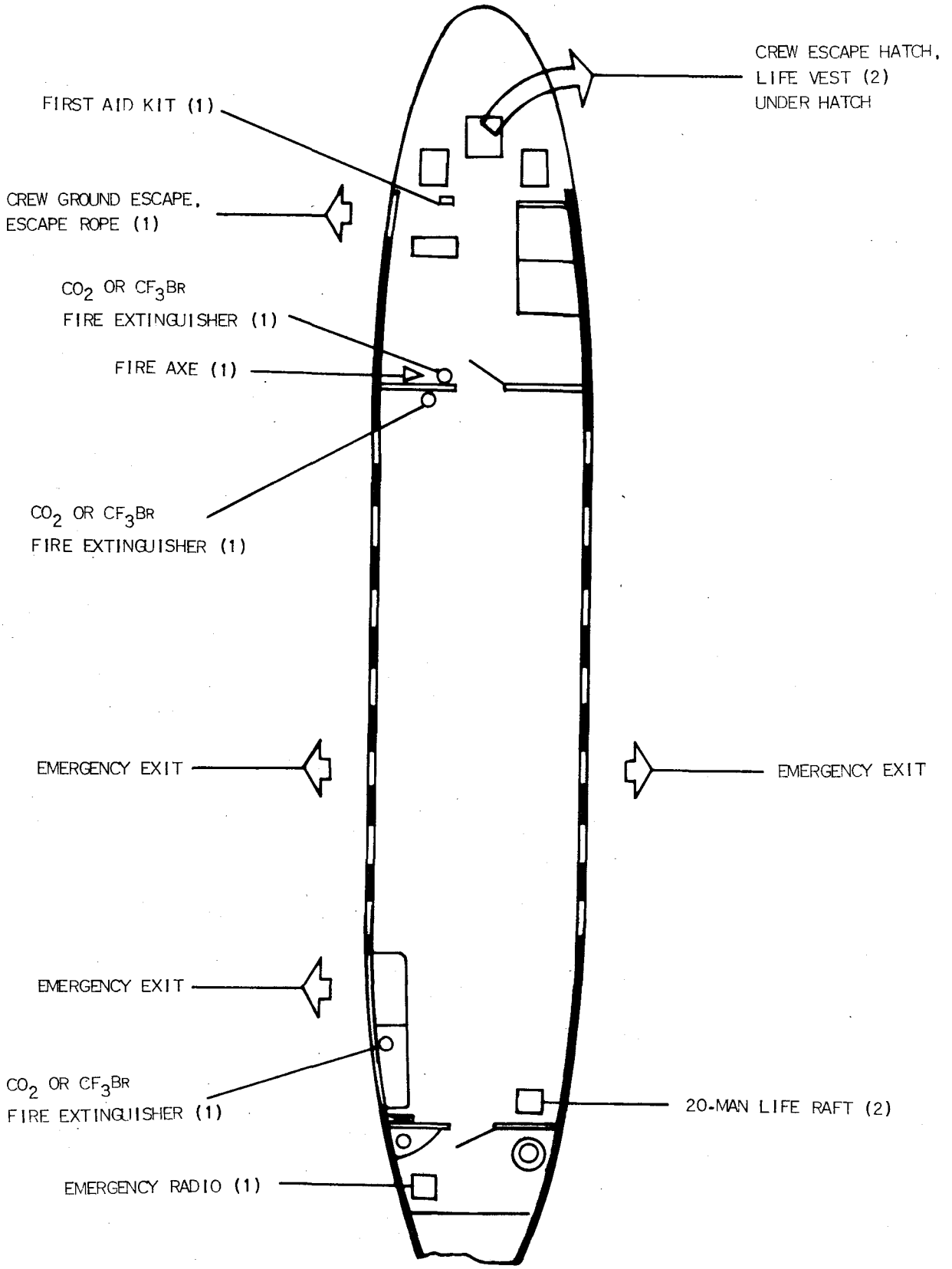


Figure 1 - 32